CSM Unit 5

Spokane River

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ABBREVIATIONS AND ACRONYMS

AWQC	ambient water quality criteria
cfs	cubic foot per second
COPC	chemical of potential concern
CSM	conceptual site model
CV	coefficient of variation
EPA	U.S. Environmental Protection Agency
EV	expected value
FIS	flood insurance study
FS	feasibility study
gpd	gallon per day
µg/L	microgram per liter
msl	mean sea level
PDF	probability density function
PRG	preliminary remediation goal
RI	remedial investigation
RI/FS	remedial investigation/feasibility study
SL	screening level
South Fork	South Fork Coeur d'Alene River
SpokaneRSeg	Spokane River segment
TMDL	total maximum daily load
URSG	URS Greiner, Inc.
USGS	U.S. Geological Survey
WRCC	Western Regional Climate Center
WSDNR	Washington State Department of Natural Resources
WSDOT	Washington State Department of Transportation
WWP	Washington Water Power Company

1.0 INTRODUCTION

CSM Unit 5 encompasses the Spokane River from its head at Coeur d'Alene Lake west to the confluence with Lake Roosevelt, the Columbia River impoundment behind Grand Coulee Dam. CSM Unit 5 is composed of three segments: segment SpokaneRSeg01 extends from Coeur d'Alene Lake to the Washington-Idaho state line and includes the Post Falls dam; segment SpokaneRSeg02 extends from the state line to the upper end of the Long Lake Reservoir; and segment SpokaneRSeg03 extends from the upper end of the Long Lake Reservoir to the confluence with Lake Roosevelt. The Spokane Valley-Rathdrum Prairie aquifer, which underlies the Spokane River valley, is a critical water supply for the Spokane area (groundwater recharge described in Section 2.2.3).

Metals discharged from Coeur d'Alene Lake in dissolved and particulate form are carried down the Spokane River. The Spokane River regularly exceeds water quality standards for zinc. Standards for lead and cadmium are also frequently exceeded, especially at higher flows (Ecology 1998).

Fine-grained sediment in the Spokane River are contaminated with lead and zinc, with generally decreasing concentrations from upstream to downstream. Sediment screening levels are exceeded in several locations where fine-grained sediment accumulates, most notably in segment SpokaneRSeg02 upstream of the City of Spokane behind dams and in reservoir sediments in segment SpokaneRSeg03.

There have been no known previous cleanup actions in the Spokane River watershed. As an interim measure, Human Health Advisories have been issued by the Spokane Regional Health District regarding fish consumption upstream of river-mile 61.5 and other recreational areas along the Spokane River upstream of river-mile 80 with contaminated sediments (Roland 2000 and HHRA 2000).

This watershed is assigned to conceptual site model (CSM) Unit 5 (see Part 1, Section 2, Conceptual Site Model Summary). The watershed itself has been divided into three segments, each including a mix of riparian, riverine, and lacustrine habitats (Figure 1-1). A brief description of the watershed is presented below.

1.1 WATERSHED DESCRIPTION

Segment SpokaneRSeg01 includes two reaches, one from Coeur d'Alene Lake to Post Falls Dam and a short reach from below Post Falls Dam to the State line. The reach above the Post Falls Dam is artificially regulated by the dam, which also regulates the level of Coeur d'Alene Lake, causing higher than natural water levels during low flow, and consequently the river in this area exhibits lower water velocities. During seasonal high flows, the gates at the dam are opened and water levels over parts of the impounded reach and upstream into Coeur d'Alene Lake, are regulated by the natural channel as is flow in the channel. The reach from Post Falls Dam to the State line is free-flowing.

Segment SpokaneRSeg02 contains both free-flowing reaches and backwaters behind low dams. These small backwater areas are one of the places where fine-grained sediments are deposited. Notable exchanges of water between the river and the aquifer occur throughout this segment. Concentrations of dissolved zinc exceed ambient water quality criteria through most of the year in the upper portions of the segment and exceed ambient water quality criteria in lower portions of the segment during high flows associated with snowmelt events and spring runoff. Concentrations of dissolved cadmium, lead, and zinc typically exceed the ambient water quality criteria during high flows. Fine-grained sediment in depositional areas, including natural shoreline beach and bar deposits (places used for water-contact recreation), show elevated concentrations of lead. The main depositional areas are behind Upriver Dam, behind the low dam at Spokane Falls in Spokane, the Upper Falls hydropower facility in Spokane at Riverfront Park, and behind Ninemile Dam downstream from Spokane. Pockets of fine-grained sediments are located behind boulders and on small beaches throughout the segment. The backwater areas behind the dams contain small amounts of habitats such as riparian wetlands, that are otherwise not common along the Spokane River. Hangman Creek enters the Spokane River just west of downtown Spokane. The flow and water dilution with contributed by Hangman Creek is typically small, but substantial amounts of clean Palouse-derived sediment (with low metals concentrations) are discharged during high spring flows.

Segment SpokaneRSeg03 consists mainly of Long Lake, a reservoir on the Spokane River created by Long Lake Dam, and the Spokane Arm of Lake Roosevelt. The Little Spokane River enters the Spokane River near the upper boundary of this segment. Concentrations of dissolved metals in the water of this segment generally do not exceed ambient water quality criteria except during snowmelt events and spring runoff. Concentrations of metals in the sediment of Long Lake are slightly elevated. Concentrations of metals in sediments in the upper part of the Spokane Arm of Lake Roosevelt are slightly elevated (mainly zinc).

1.2 REPORT ORGANIZATION

The remedial investigation report is divided into seven parts. This report on Spokane River is Part 6, presenting the remedial investigation (RI) results for CSM Unit 5. The content and organization of this report are based on the U.S. Environmental Protection Agency's (EPA) Guidance Document for Conducting Remedial Investigations and Feasibility Studies under CERCLA, Interim Final (USEPA 1988). This report contains the following sections:

- Section 2–Physical Setting, includes discussions on the watershed's geology, hydrogeology, and surface water hydrology.
- Section 3–Sediment Transport Processes
- Section 4–Nature and Extent of Contamination, includes a summary of chemical results and estimates of mass loading from source areas
- Section 5–Fate and Transport, includes chemical and physical transport processes for metals
- Section 6–References

Risk evaluations and potential remedial actions associated with source and depositional areas are described in the human health risk assessment, the ecological risk assessment, and the feasibility study (all under separate cover).

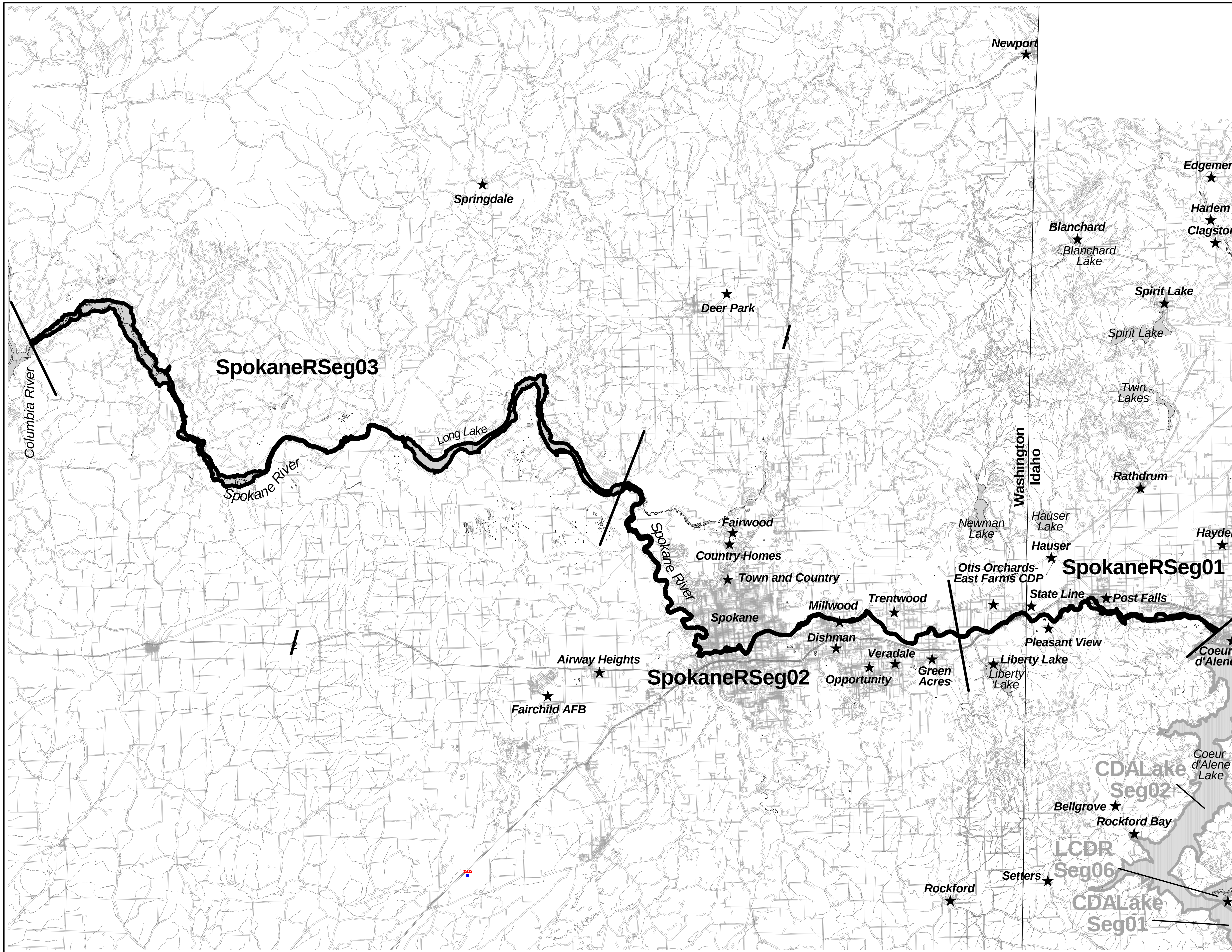

Figure 1.1-1
Spokane River Watershed

LEGEND

- Stream
- Road
- Interstate/Highway
- City
- Stateline
- Spokane River Watershed
- Segment Boundary Marker
- River Segment
- Lake/River

Location Map

NOTES

1) Base map coverages obtained from the Coeur d'Alene Tribe, US Census, URS Greiner Inc., CH2M HILL, and the Bureau of Land Management.

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Coeur d'Alene Basin RI/FS
RI REPORT

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V: Spokane River
E: Spokane R
L: Final RI Spokane R
7/03/01

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: July 3, 2001

2.0 PHYSICAL SETTING

2.1 GEOLOGY

The complex geology of the Spokane River Valley results from a variety of geologic events. These include uplift and erosion of ancient mountain ranges; subsequent widespread extrusion of basalt lava flows; subsequent erosion by streams draining the mountains on the north and east, resulting in a significant deepening of the ancestral lower Spokane River Valley floor; movement into the area of glacial ice from the north, with erosion of the mountains and deposition of sands and gravels in the lowlands; and catastrophic inundation by the Spokane Floods (Molenaar 1988).

2.1.1 Geomorphic Setting

The Spokane River roughly follows the boundary between two major physiographic provinces: the Columbia Plateau to the south, and the Northern Rocky Mountains to the north (Johnson 1992). The upper reaches of the river, from its origin at the outlet of Coeur d'Alene Lake to its confluence with the Little Spokane River (segments SpokaneRSeg01 and SpokaneRSeg02), flow through the Spokane River Valley, a lowland area about 30 miles long and 3 to 8 miles wide. The valley is flanked by two relatively isolated highland outliers of the Selkirk Mountains; these culminate on the north at 5,878-foot Mount Spokane and on the south at 5,205-foot Mica Peak (Figure 2.1.1-1) (Molenaar 1988). Along the lower reach of the river (segment Spokane RSeg03), the valley becomes narrow, and the river's course is entrenched within complexly terraced alluvial valley fill (Johnson 1992). The dominant geomorphic feature in the upper Spokane River Valley is the Purcell Trench, a structural, physiographic feature that extends north-south from Canada to Coeur d'Alene . The Spokane Valley may be a westward extension of this feature (Rapp 2000). The dominant geomorphic feature of the lower Spokane River Valley is a system of terraces, flanking the river for much of its length (Johnson 1992).

2.1.2 Bedrock Geology

The pre-Tertiary rocks of the Mount Spokane uplands and Mica Peak, north and south of the Rathdrum Prairie, have been mapped as both highly metamorphosed Precambrian sediments of the Belt Supergroup and pre-Belt schists and gneisses. All of these rocks have been intruded by granitic rocks of Cretaceous age (Wyman 1993). These Cretaceous intrusive rocks include granite, granodiorite, quartz monzonite, quartz diorite, and diorite (Johnson 1992).

Basalt flows of the Tertiary Columbia River Basalt Group overlie the pre-Tertiary metasediments and granitic intrusive rocks. The Columbia River Basalt Group is composed of Miocene-age tholeiitic flood basalts and interbedded sediments. Along the lower reach of the river, Grande Ronde basalts overlie the metasedimentary and granitic rocks, and Wanapum basalts rest directly upon the Grande Ronde basalts (Johnson 1992). Along the upper reaches of the river, the basalts are intercalated with lacustrine deposits of the Latah Formation, which is characterized by thick sequences of shale or clay with some sands and gravels (Wyman 1993).

Older intrusive and volcanic rocks are mantled by surficial deposits of Quaternary age. These surficial deposits are a complex assemblage of Holocene alluvial and Pleistocene glacial, glaciofluvial, glaciolacustrine, landslide, loess, and catastrophic flood deposits (Johnson 1992).

2.1.3 Structural Geology

The Purcell Trench is the dominant structural control in the upper Spokane River Valley. The structure extends from 200 miles north of the Canadian border south to the Rathdrum Prairie. The major north-south trending valley between the Coeur d'Alene Mountains and the Mount Spokane uplands, in the northern Rathdrum Prairie, is probably the southern extension of the Purcell Trench (Wyman 1993).

In the lower Spokane River Valley, fracture systems and shear zones associated with intrusive rocks are abundant, and a prominent north-to-northeast trending lineament system has been identified. Numerous faults and joints also occur within the interlayered deposits of the Columbia River Basalt Group (Johnson 1992).

2.1.4 Soils

The Garrison gravelly loam is the dominant soil in the upper Spokane River Valley. The Garrison series is made up of somewhat excessively drained, gravelly or stony soils formed under grass in glacial outwash (SCS 1968). The extensive Quaternary deposits in the lower Spokane River valley are covered by soils of the Springdale association, which includes the Springdale, Marble, Clayton, Spens, Dart, and Koerling series. The Springdale soils are the most aerially extensive, blanketing most of the prominent terrace surfaces and slopes. These soils have developed in the glacial outwash and flood deposits that comprise the terraces, and are thus characteristically medium-to-coarse grained sandy, gravelly, and cobbly loams (Johnson 1992).

2.1.5 Metal Sources

Controlling factors for metals concentrations in surface water and groundwater within the Spokane River basin primarily include bedrock/river/aquifer interaction and the impact from mining activities in the Coeur d'Alene mining district (Zheng 1995). Metals from the Coeur d'Alene River basin enter the system at the outlet of Coeur d'Alene Lake via surface water, sediments and groundwater. As early as the mid-1920s, fine-grained tailings discharged into the Coeur d'Alene River were observed moving across Coeur d'Alene Lake and into the Spokane River (Casner 1991). Today, concentrations of metals in surface water discharged from the lake exceed ambient quality periodically through the year.

In addition, metals could potentially enter the Spokane River system from urbanized and industrialized areas (e.g., stormwater discharge, sewage treatment plants, industrial site contamination). However, no municipal or industrial discharges capable of producing widespread metals loading exist along the river below Post Falls Dam.

Mining locations in the lower Spokane River Valley are other potential sources of metals to the river basin. No impacts to the river from these sources have been documented. The two largest locations are uranium mines on the Spokane Indian Reservation (the Midnite Mine and the Sherwood Mine) (Nash and Williams 1975). The Midnite Mine is located on Blue Creek, about 4 miles northeast of the Spokane River. The mine has an associated mill, the Dawn Mill, located about 10 miles to the east on Chamokane Creek near Ford. The Midnite Mine has recently been added to the National Priorities List (Federal Register 2000). The Sherwood Mine is located adjacent to the Spokane River above the mouth of Blue Creek.

2.2 HYDROGEOLOGY

The dominant hydrogeologic feature in the Spokane River Valley is the Spokane Valley-Rathdrum Prairie aquifer, an unconfined aquifer formed in the coarse sand, gravel, cobbles, and boulders deposited by the Spokane Floods. As the only significant good-quality water in the Spokane Valley, the aquifer has been designated as a "sole source aquifer" by the EPA (Molenaar 1988). The Spokane Valley-Rathdrum Prairie aquifer is separated from the unconfined hydrogeologic system of the lower Spokane River Valley by a northwest-southeast trending ridge of granitic rock that outcrops in the vicinity of Ninemile Dam, just upstream of the confluence of the Spokane and Little Spokane Rivers (Johnson 1992).

2.2.1 Aquifer Parameters

The Spokane Valley-Rathdrum Prairie aquifer underlies an area of about 327 square miles; 125 in Washington and 202 in Idaho (SCWQMP 1992). Along the valley sides, the aquifer boundary has abrupt lateral contacts with the sloping surfaces of the bedrock hillsides. In other places, the boundary grades into less permeable unconsolidated materials not easily distinguishable from the aquifer materials. The thickness of the aquifer beneath much of the Spokane River Valley is not well defined, as only 10 wells are recorded as penetrating the aquifer at its base on the Latah Formation or the basalts (Molenaar 1988). The aquifer is generally thickest in the northern area and thins to the south and southwest. Near the Idaho/Washington state line, a 1953 seismic survey indicated that the glacial alluvium is 340 to 376 feet thick, of which 225 feet is saturated (Wyman 1993). Well records in the Hillyard Trough, north of Spokane, indicate that the penetrated thickness of gravel and sand is, at least locally, more than 300 feet (Molenaar 1988).

2.2.2 Flow Rates and Directions

The water table in the Spokane Valley-Rathdrum Prairie aquifer slopes from Pend Oreille Lake southward to the Rathdrum/Coeur d'Alene area and south-southwest toward Spokane. In the vicinity of the outlet of Coeur d'Alene Lake and the Spokane River above Post Falls, the water table slopes to the northwest and then westerly down the Spokane Valley. The maximum height of the water table in the aquifer is approximately 2,180 feet above mean sea level (msl) in the northern part of the aquifer in Idaho. The water table slopes downward to an elevation of about 1,970 feet at the Idaho/Washington state line. From there the water table declines to a minimum elevation of 1540 feet near Ninemile Falls, Washington (Wyman 1993).

The Spokane Valley-Rathdrum Prairie aquifer is known for its exceptionally high transmissivities. The estimated transmissivity west of Post Falls is 25.4 gpd/ft (gallons per day per foot) (3.4 million square feet per day). Estimates of hydraulic conductivity at Post Falls range from 254 to 2,141 feet per day (Wyman 1993). It is estimated that between 350 and 650 million gallons per day crosses the state line in the aquifer (SCWQMP 1992).

2.2.3 Surface Water/Groundwater Interaction

Several studies have addressed the hydrologic connection of the Spokane River and tributaries with the Spokane Valley–Rathdrum Prairie aquifer; however, the river-aquifer interaction is not well understood in detail (Johnson 1992). The Spokane River loses water to the aquifer throughout segment SpokaneRSeg01 from the outlet of Coeur d'Alene Lake to the Otis Orchards area. According to a study by Wyman (1993), about 30 percent of the recharge to the aquifer in the Rathdrum Prairie is from Coeur d'Alene Lake and the Spokane River; although not quantified, the lake contributes most of the recharge via underflow. Downstream the river then alternately loses water to and gains water from the aquifer; the Little Spokane River gains from the aquifer, except near its confluence with the Spokane River, where it may be losing (Vaccaro and Bolke 1983).

The Washington State Department of Ecology, in conjunction with Spokane County, conducted a study of the interactions between Spokane River and the upper Spokane aquifer (Ecology 2001). The study encompassed the spring runoff period through the fall low-flow season in 1999 to determine the upper aquifer response to river flow patterns. The study area for this project was from the Washington/Idaho state line to Sullivan Road, between river miles 96 and 87 in Trentwood. The primary findings of this study are that the Spokane River loses water to the aquifer during high-flow conditions from May through September and gains water from the aquifer in September during low-flow conditions.

Additionally, the EPA, as part of their Wellhead Protection Demonstrations Project, evaluated the physical interaction between the Spokane River and the Spokane aquifer (Gearhart and Buchanan 2000). From December 1998 through July 1999, five river reaches were studied from State Line, Idaho to Spokane, Washington. Results of this study are presented in Table 2.2-2.

Results of the study indicate that in the upper portions of the river in the study area, surface water is lost to groundwater (e.g., a losing reach), while in the lower portions of the river in the study area, groundwater discharges to surface water (e.g., a gaining reach). Losing and gaining conditions are highly dependent on surface water flow conditions within the river (e.g., high or low flow rates) and operations of the Upriver Dam. The Upriver Dam has a very large influence on the groundwater table in the area surrounding the dam. The dam creates a very drastic change in elevation for the river, and thus affects the flow of groundwater into and out of the river both above and below the dam.

Recharge to the aquifer occurs principally by underflow from Coeur d'Alene Lake and other lakes, inflow from tributaries, infiltration from precipitation and snowmelt, infiltration of irrigation water and septic-tank drain fields, and locally, loss from the Spokane River (Molenaar 1988; Wyman 1993). Discharge from the aquifer occurs principally by local loss to the Spokane and Little Spokane Rivers, well withdrawals, and evapotransporation.

2.2.4 Groundwater Quality and Chemistry

Groundwater in the Spokane Valley-Rathdrum Prairie aquifer is calcium and bicarbonate dominant (Vaccaro and Bolke 1983). Chloride content is generally low. Hardness is generally higher (average of 168 mg $CaCO_3$/L) than in the river (ranges from approximately 20 mg $CaCO_3$/L at Post Falls to approximately 60 mg $CaCO_3$/L at the outlet of Long Lake). A summary of water quality data is presented in Table 2.2-1. Specific conductance exhibits a high positive correlation with dissolved solids, hardness, calcium, alkalinity, bicarbonate, and magnesium (Vaccaro and Bolke 1983).

2.2.5 Groundwater Use

Groundwater from the Spokane Valley-Rathdrum Prairie aquifer provides most of the water used for domestic, municipal and industrial (other than aluminum production) purposes and a large part of the irrigation supply (Sagstad 1977; Molenaar 1988).

The total amount of groundwater pumped from the Spokane Valley portion of the aquifer in 1977 was about 164,000 acre-feet. Major irrigation supplies accounted for about 15 percent and major industrial supplies accounted for about 15 percent. The remaining 70 percent was withdrawn for municipal and domestic use (Molenaar 1988).

2.3 SURFACE WATER HYDROLOGY

Surface water hydrology of the Spokane River Watershed is described in this section. The Spokane River Watershed within the CSM boundary has areal extent of approximately 34.7 square miles with approximately 110 miles of mapped channel. The total drainage area above the U.S. Geological Survey (USGS) gage at Long Lake, located approximately 31 miles upstream of the mouth, is approximately 6,020 square miles. The total drainage area of the entire basin from the mouth to the headwaters is roughly 6,560 square miles. The Spokane River is fed by the only outlet of Coeur d'Alene Lake. In general, the Spokane River flows east to west from Coeur d'Alene Lake to the confluence with the Columbia River near Fort Spokane, Washington. The Spokane River has two major tributaries, Little Spokane River and Hangman Creek, also known as Latah Creek.

For the Spokane River for water year 1999, the mean daily discharge of 7,530 cfs at Post Falls is equal to that measured for the Spokane River at Spokane (USGS 2000). The addition of 315 cfs from Hangman Creek and 690 from the Little Spokane River, and other, unmeasured, inflows increase the mean daily discharge of the Spokane River at Long Lake to 9,240 cfs, and 18.5 percent increase from the Spokane gage (USGS 2000).

The surface water hydrology of the Spokane River is controlled by discharge of the tributary streams to Coeur d'Alene Lake, the North and South Forks of the Coeur d'Alene River and the St. Joe River, among others, as well as the operation of seven hydroelectric power plants on the Spokane River. The power plants and reservoirs are operated by Avista Corporation (formerly Washington Water Power Company (WWP).

Approximately 8.9 miles downstream of Coeur d'Alene Lake, the WWP operates the Post Falls Dam within segment SpokaneRSeg01. This uppermost section of the Spokane River is essentially an extension of Coeur d'Alene Lake during much of the year. The water impounded by the Post Falls Dam is maintained at a normal summer elevation of 2,128 feet. Drawdown of lake elevation occurs from mid September through January to an elevation of 2,122 feet (Wyman 1993). This drawdown may provide storage for flood attenuation downstream. The Post Falls Dam can regulate flows up to 15,000 cubic feet per second (cfs) at a lake stage of 2,128 feet. When lake stage exceeds 2,128 feet, the control passes from the dam to the natural outlet channel (FIA 1992).

Five dams and power plants are contained in segment SpokaneRSeg02. Four of these are located within the Spokane city limits. The Spokane Dam, the Upper Falls Dam (made up of two dams on either side of Havermale Island), the Monroe Street Dam, and the Upper Dam are located within the Spokane city limits. The Ninemile Falls power plant is located about 13.7 miles downstream of the City of Spokane.

Two dams are located in segment SpokaneRSeg03: Long Lake Dam and Little Falls Dam. The lower 22 miles of the Spokane River is contained in the backwater of the Columbia River above Grand Coulee Dam.

The Spokane River Watershed experiences spring snowmelt and winter rain and rain on snow floods. Spring and summer floods are the result of snowmelt runoff in the upper watersheds. Winter floods are caused by periods of rainfall accompanied by warm temperatures. In these winter floods, snowmelt, and rainfall combine to produce intense, short duration runoff. Discharge from most events is attenuated by storage of storm water in Coeur d'Alene Lake (FIA 1982).

2.3.1 Available Information

Hydrologic information for the Spokane River watershed used in this report includes USGS stream flow data from three gages on the Spokane River, station 12419000, Spokane River near Post Falls, station 12422500, Spokane River near Spokane, and station 12433000, Spokane River at Long Lake (USGS 2000). Periods of record vary from station to station.

Precipitation data from the Western Regional Climate Center (WRCC) station at the Spokane Airport were collected for water year 1999 (WRCC 2000). This precipitation gage is the near the stream gages at Post Falls, Spokane, and Long Lake. The mean daily discharge hydrograph and precipitation data for water year 1999 are presented in Figure 2.3.1-1 for the Spokane River at Post Falls, 2.3.1-2 for the Spokane River at Spokane, and 2.3.1-3 for the Spokane River at Long Lake. The maximum mean daily discharge for water year 1999 was 23,500 cfs at Post Falls, 22,400 cfs at Spokane, and 25,100 cfs at Long Lake on May 31, 1999.

In addition to the USGS hydrologic information, the U.S. Department of Housing and Urban Development, Federal Insurance Administration completed a flood insurance study for the City of Spokane and Spokane County, Washington (FIA 1982 and 1992). These documents report computed peak discharges for 10-year (37,500 cfs), 50-year (47,000 cfs), 100-year (52,000 cfs) and 500-year (65,000 cfs) events near Otis Orchard downstream of Post Falls Dam in segment SpokaneRSeg01. In segment SpokaneRSeg02, the computed peak discharges at the downstream Spokane City limit are the following: 10-year (38,000 cfs), 50-year (47,600 cfs), 100-year (52,700 cfs) and 500-year (65,900 cfs). Although these reported values might be dated and may contain some error, they do provide some basis for selecting a design discharge for remedial actions. The bankful discharge, the approximately 1.5-year event, is estimated to be approximately 25,600 cfs at Otis Orchard and 26,000 cfs downstream of the Spokane city limits.

2.3.2 Hydrologic Description

The hydrology of the Spokane River Watershed based on modeled stream discharge and precipitation data is presented in this section.

2.3.2.1 Historical Description

The USGS gage on the Spokane River near Post Falls is in segment SpokaneRSeg01. The period of record for this gage is January 1, 1913 to present. The mean daily discharge hydrograph for water year 1914 to 1999 are presented in Figures 2.3.2-1 and 2.3.2-2. The maximum instantaneous discharge for this gage was 50,100 cfs and occurred on December 23, 1933. The minimum discharge was measured at 65 cfs on July 25 and 30, 1973 (USGS 1999). The average annual discharge for the period of record is approximately 6,270 cfs. Typically, annual peak discharge varies from 15,000 to 30,000 cfs.

The USGS gage on the Spokane River near Spokane is located in segment SpokaneRSeg02. The period of record for this gage is April 1, 1891 to 1999. The mean daily discharge hydrographs for water year 1914 to 1999 are presented in Figures 2.3.2-3 and 2.3.2-4. The maximum instantaneous discharge for this gage was estimated at 49,000 cfs and occurred on May 31, 1894. The minimum discharge was measured at 49.7 cfs on August 26, 1991 during a period of flow regulation for construction at Post Street Dam (USGS 1999). The average annual discharge for the period of record is approximately 6,750 cfs. Typically, annual peak discharge varies from 15,000 to 30,000 cfs.

The USGS gage on the Spokane River near Long Lake is located in segment SpokaneRSeg03. The period of record for this gage is April 1, 1931 to present. The mean daily discharge hydrographs for water year 1940 to 1999 are presented in Figures 2.3.2-5 and 2.3.2-6. The maximum instantaneous discharge for this gage was measured at 49,700 cfs and occurred on January 19, 1974. The minimum discharge was measured at 90 cfs on October 23, 1994 (USGS 1999). The average annual discharge for the period of record is approximately 7,810 cfs. Typically, annual peak discharge varies from 15,000 to 30,000 cfs.

2.3.2.2 Flood Frequency

Tables 2.3-1 and 2.3-2 present the estimated discharges for specified flood frequency recurrence intervals for the Spokane River. Because discharge throughout the Spokane River is regulated by several dams, a frequency analysis was not completed. Instead, flood frequencies developed in the flood insurance study are presented. The values shown in Tables 2.3-1 and 2.3-2 might provide guidance for design of remedial actions.

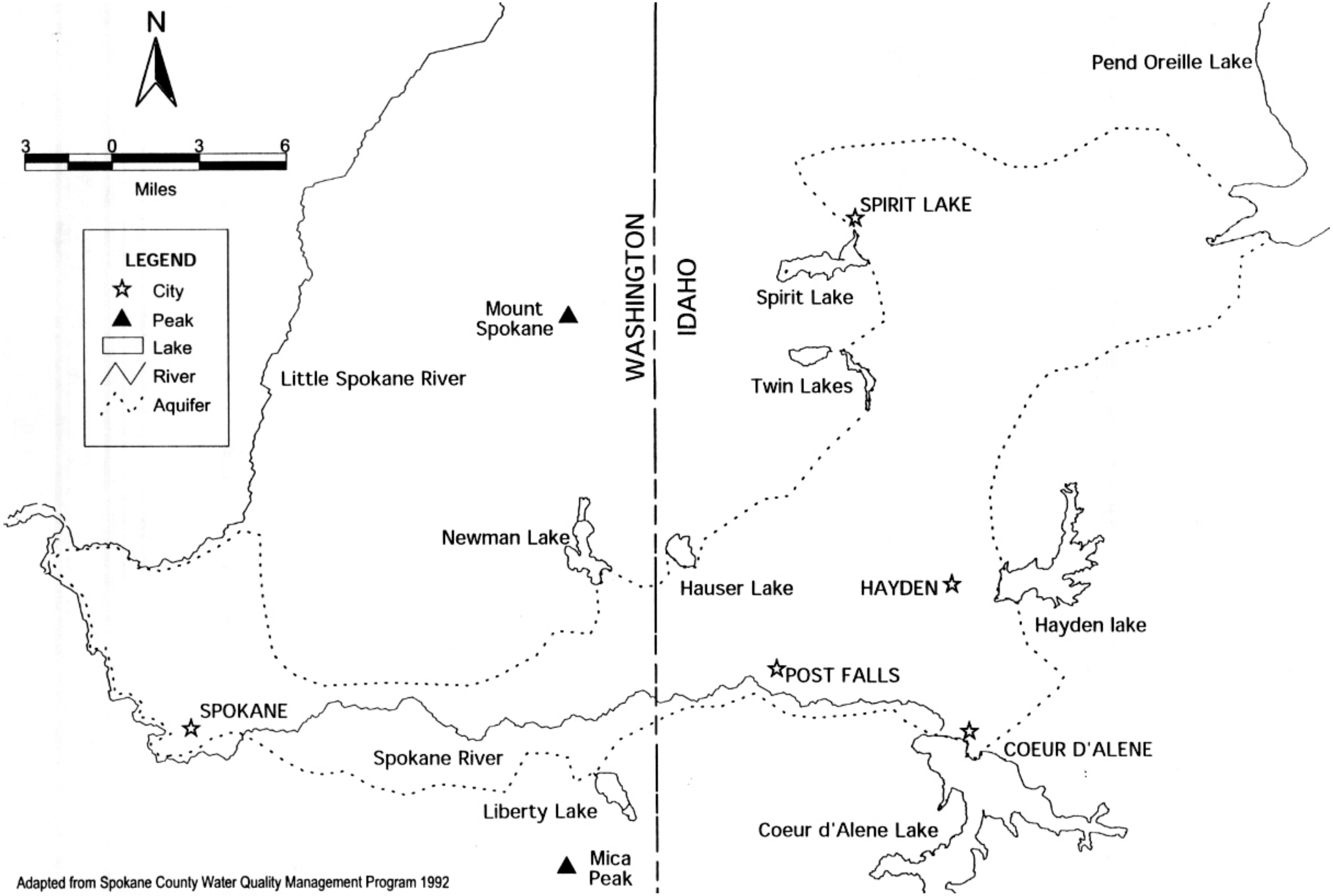
2.3.2.3 Water Year 1999

Total annual average precipitation at the WRCC Spokane Station for the 110-year period of record is 16.1 inches, while for water year 1999 the total precipitation was 16.9 inches (WRCC 2000). Total annual average snowfall for the WRCC station is 41.6 inches, while for water year 1999 the total snowfall was 42.5 inches. While these comparisons do not address monthly variations in precipitation, they do indicate that the water budget for water year 1999 was typical at the Spokane Airport precipitation station.

Table 2.3-3 summarizes the mean monthly flows, for the Spokane River at Post Falls, Spokane and Long Lake, total monthly precipitation (rain and snow water content), and total snowfall at the WRCC station at the Spokane Airport for water year 1999. Table 2.3-2 and Figures 2.3.1-1 to 2.3.1-3 indicate the majority of precipitation occurred from October to March, 79 percent of the total annual precipitation. Similar precipitation patterns occurred in watersheds in the upper basin. Much of the precipitation in the upper basin was in the form of snow and did not run off into the stream channels immediately.

The increase in discharge during the spring and summer is attributed to increased runoff caused by snowmelt in the upstream watersheds. Maximum daily temperature and mean daily discharge for water year 1999 for the Spokane River at Post Falls, Spokane, and Long Lake are presented in Figures 2.3.2-7 through 2.3.2-9. A time lag between periods of increased temperature and increased discharge is evident in Figures 2.3.2-7 through 2.3.2-9 that is a function of the travel time of the water moving downstream from the upper watersheds. Increased temperatures over these periods melted much of the snow in the upper basin. Rain on snow also may have contributed to these increased discharges as indicated in Figures 2.3.1-1 through 2.3.1-3, where precipitation events also occurred during periods of increased temperature.

Water year 1999 was typical from a total snowfall and total water budget at Spokane. Runoff from spring snowmelt in the watersheds upstream of the Spokane River and regulation at the Post Falls dam dominate the surface water hydrology. Variations in snowfall, temperature, and rainfall from year to year will influence the magnitude and timing of peak discharges.



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RI REPORT

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Spokane River Series
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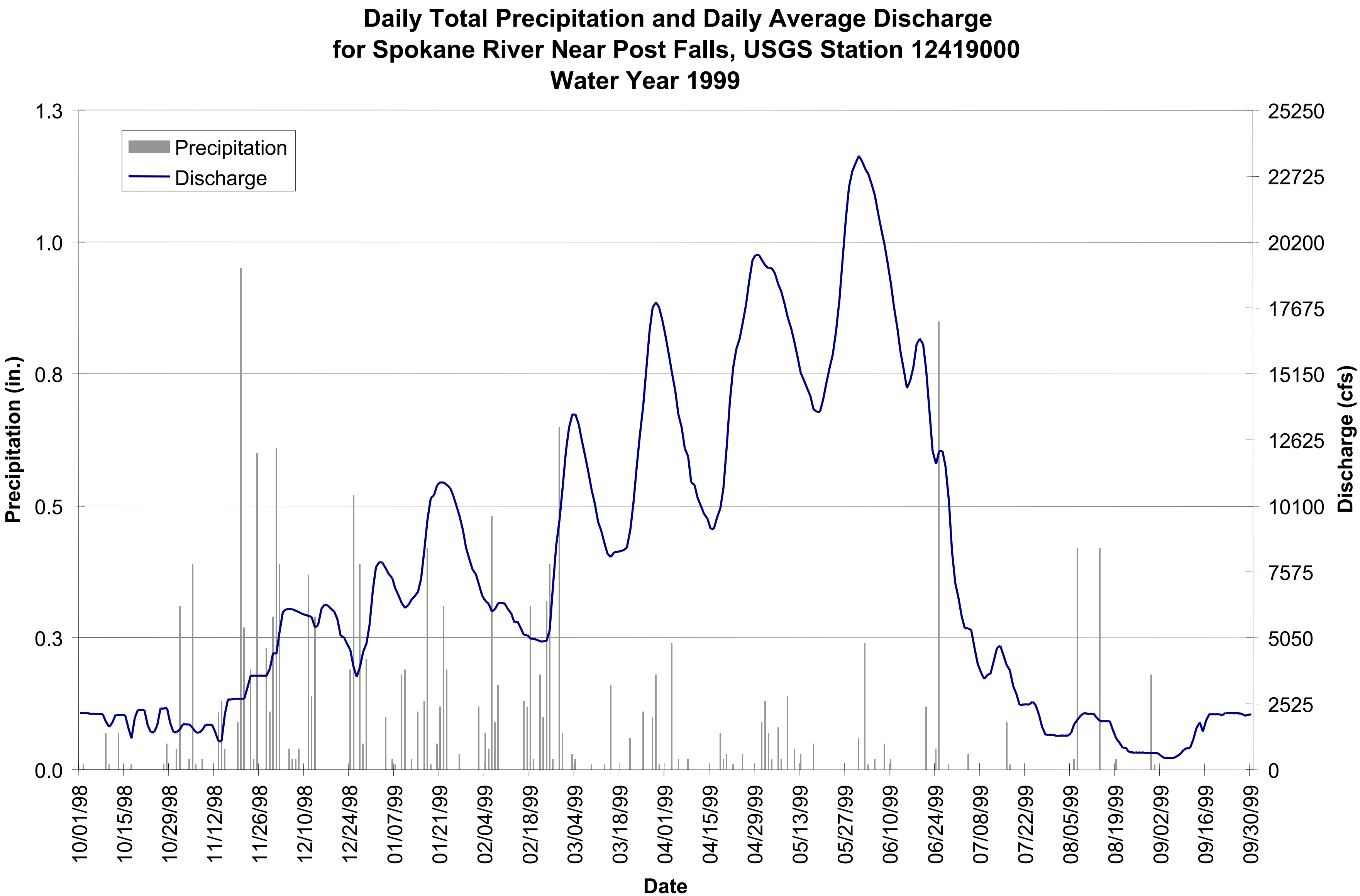
Figure 2.1.1-1
General Location of the Spokane Valley – Rathdrum Prairie Aquifer



EPA REGION 10

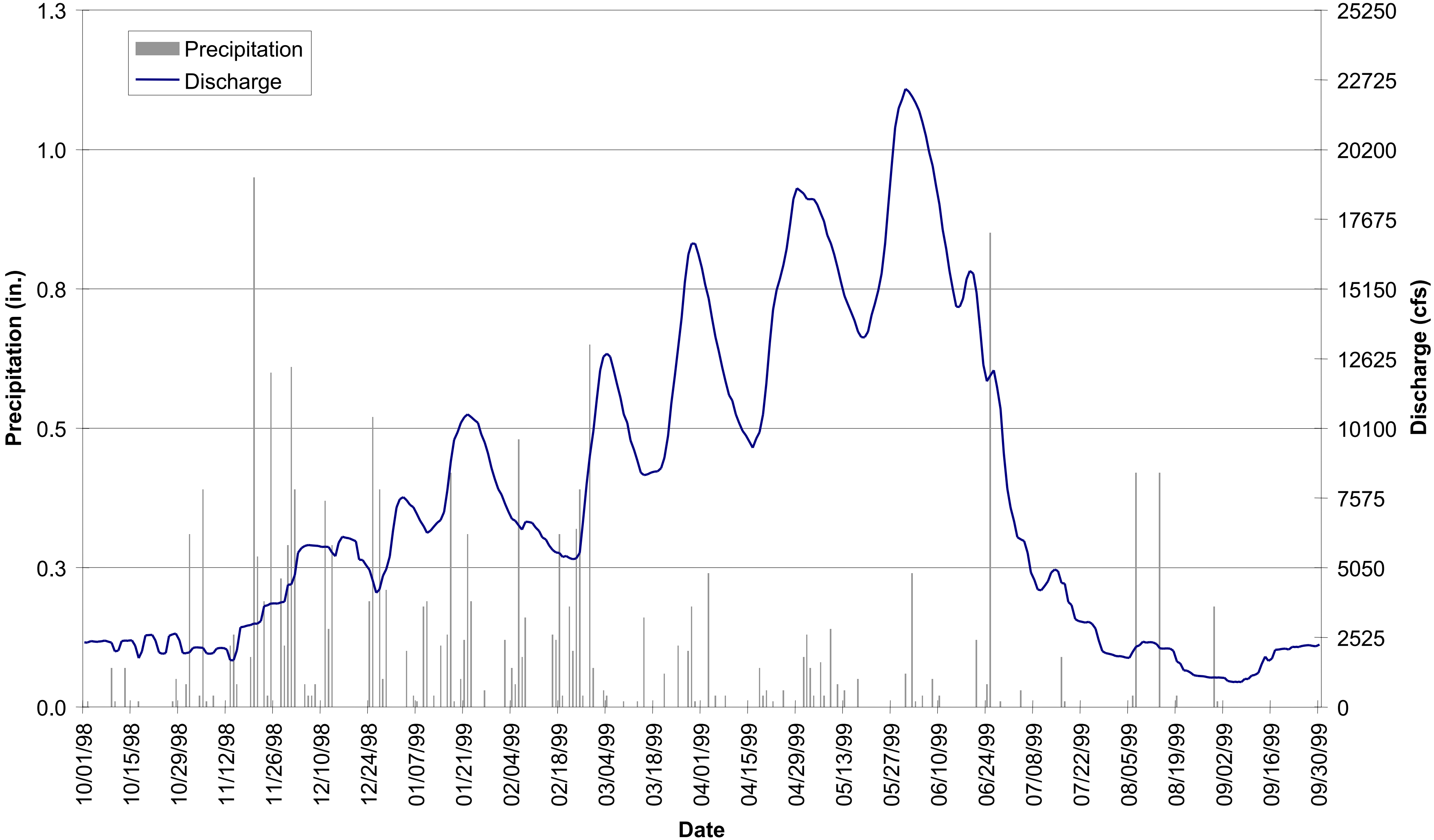
027-RI-CO-102Q
Coeur d'Alene Basin RI/FS
RI REPORT

Doc Control: 4162500.6615.05.a
Generation: 1

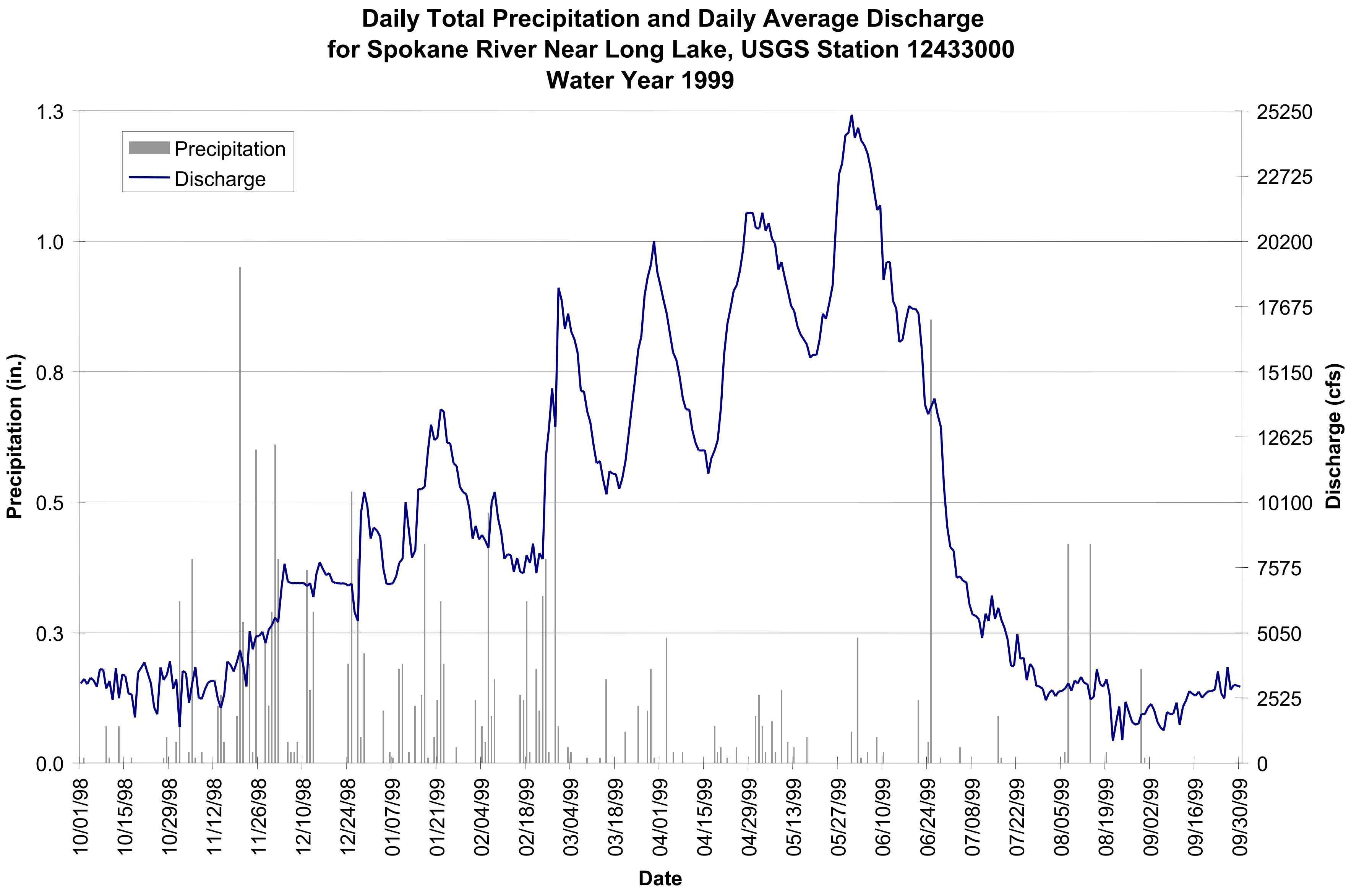
Spokane River Series
6/20/01

Figure 2.3.1-1

Daily Total Precipitation and Daily Average Discharge for Spokane River Near Spokane, USGS Station 12422500 Water Year 1999



EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS RI REPORT	Doc Control: 4162500.6615.05.a Generation: 1 Spokane River Series 6/20/01	Figure 2.3.1-2



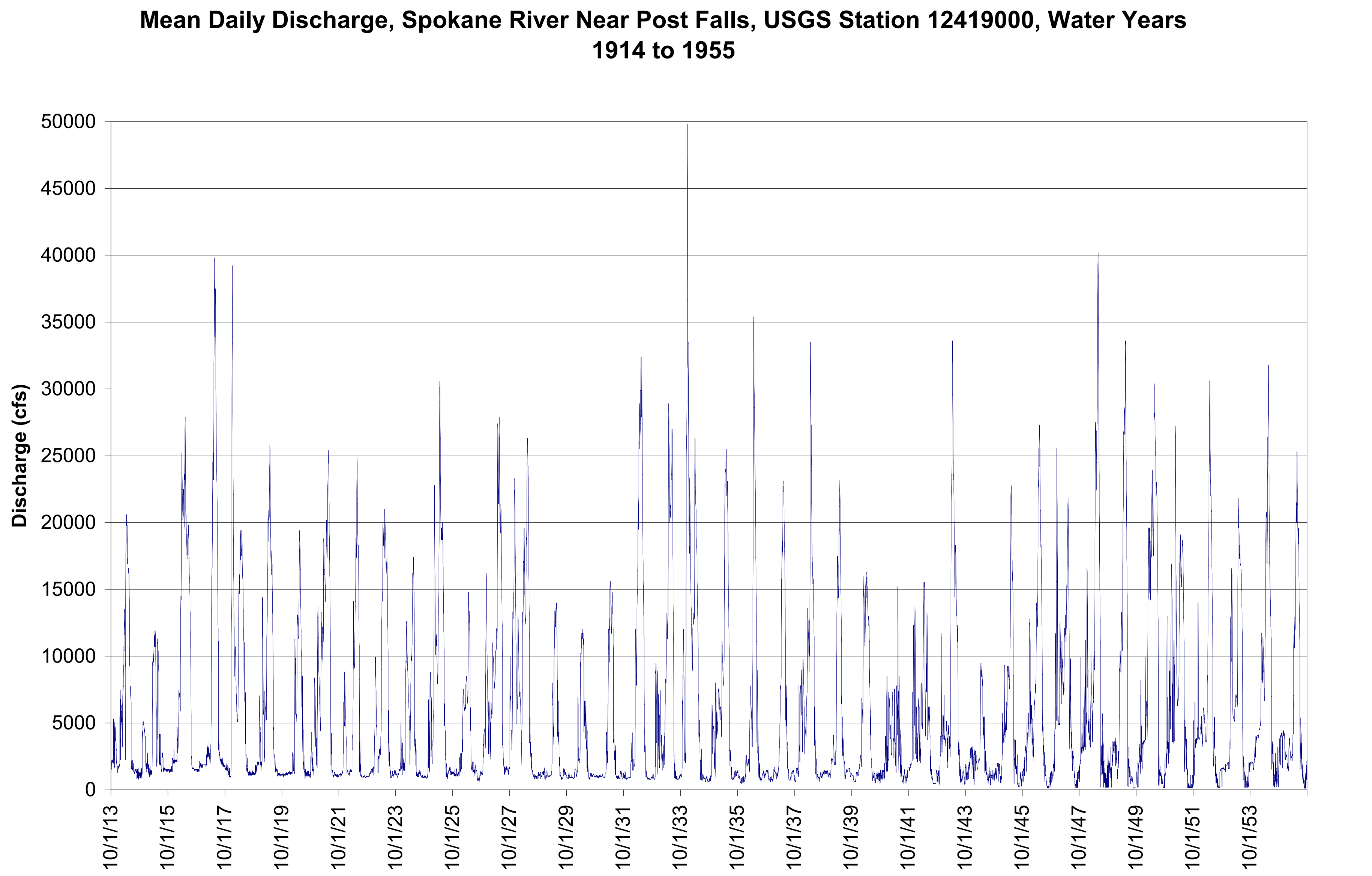
EPA REGION 10

027-RI-CO-102Q
Coeur d'Alene Basin RI/FS
RI REPORT

Doc Control: 4162500.6615.05.a
Generation: 1

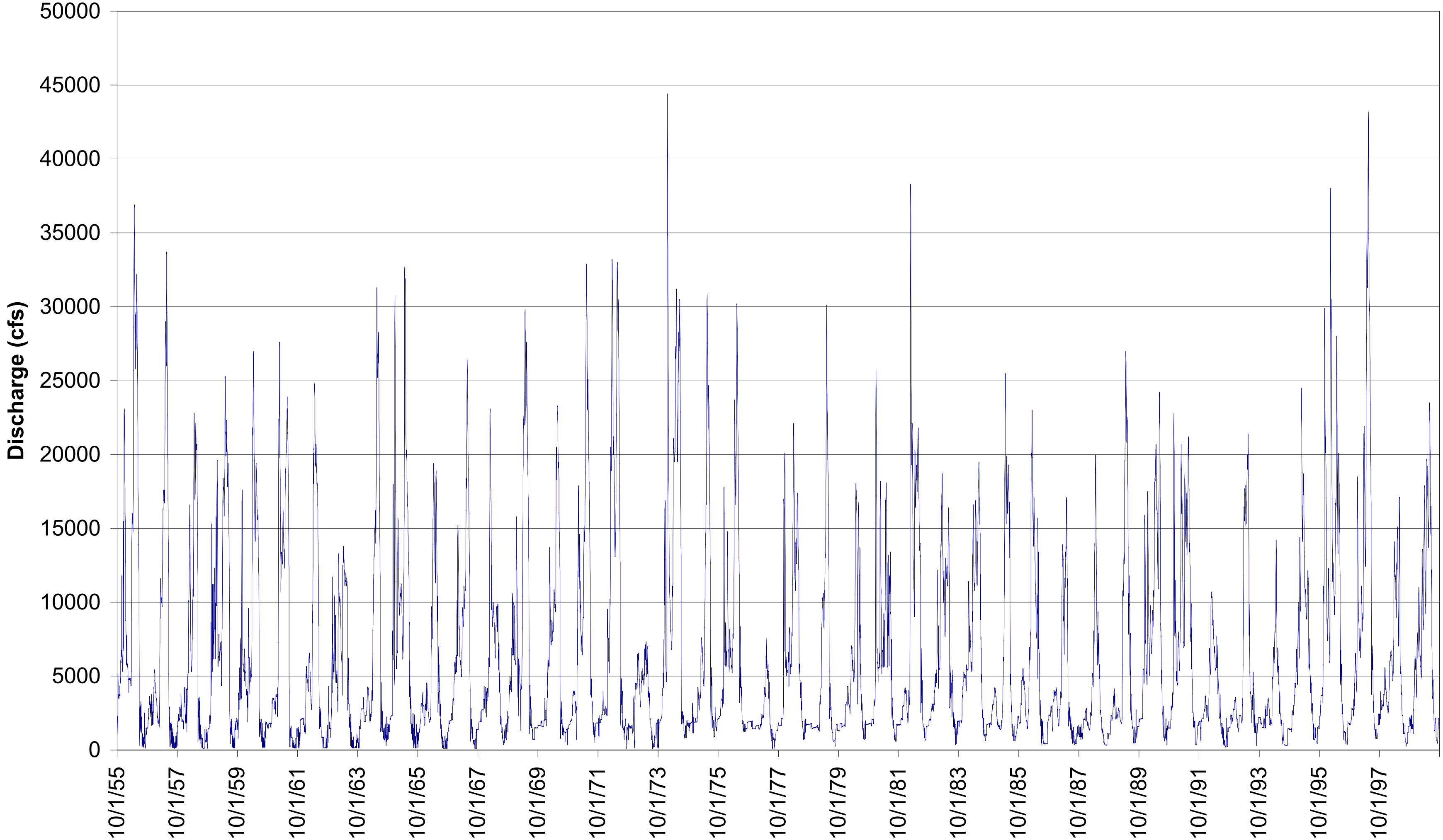
Spokane River Series
6/20/01

Figure 2.3.1-3



EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS RI REPORT	Doc Control: 4162500.6615.05.a Generation: 1 Spokane River Series 6/20/01		Figure 2.3.2-1

Mean Daily Discharge, Spokane River Near Post Falls, USGS Station 12419000, Water Years 1956 to 1999



EPA REGION 10

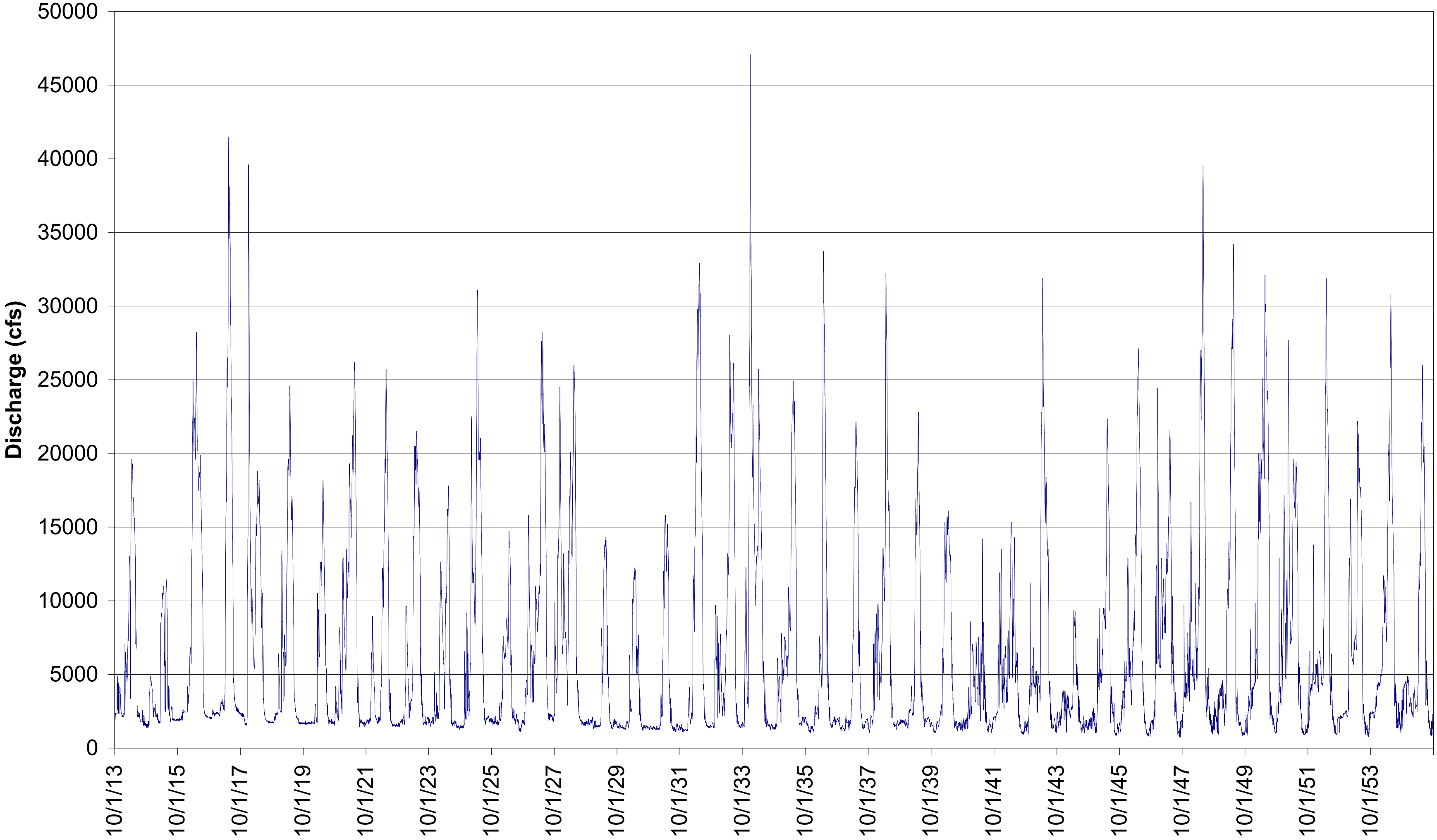
027-RI-CO-102Q
Coeur d'Alene Basin RI/FS
RI REPORT

Doc Control: 4162500.6615.05.a
Generation: 1

Spokane River Series
6/20/01

Figure 2.3.2-2

Mean Daily Discharge, Spokane River Near Spokane, USGS Station 12422500, Water Years 1914 to 1955



EPA REGION 10

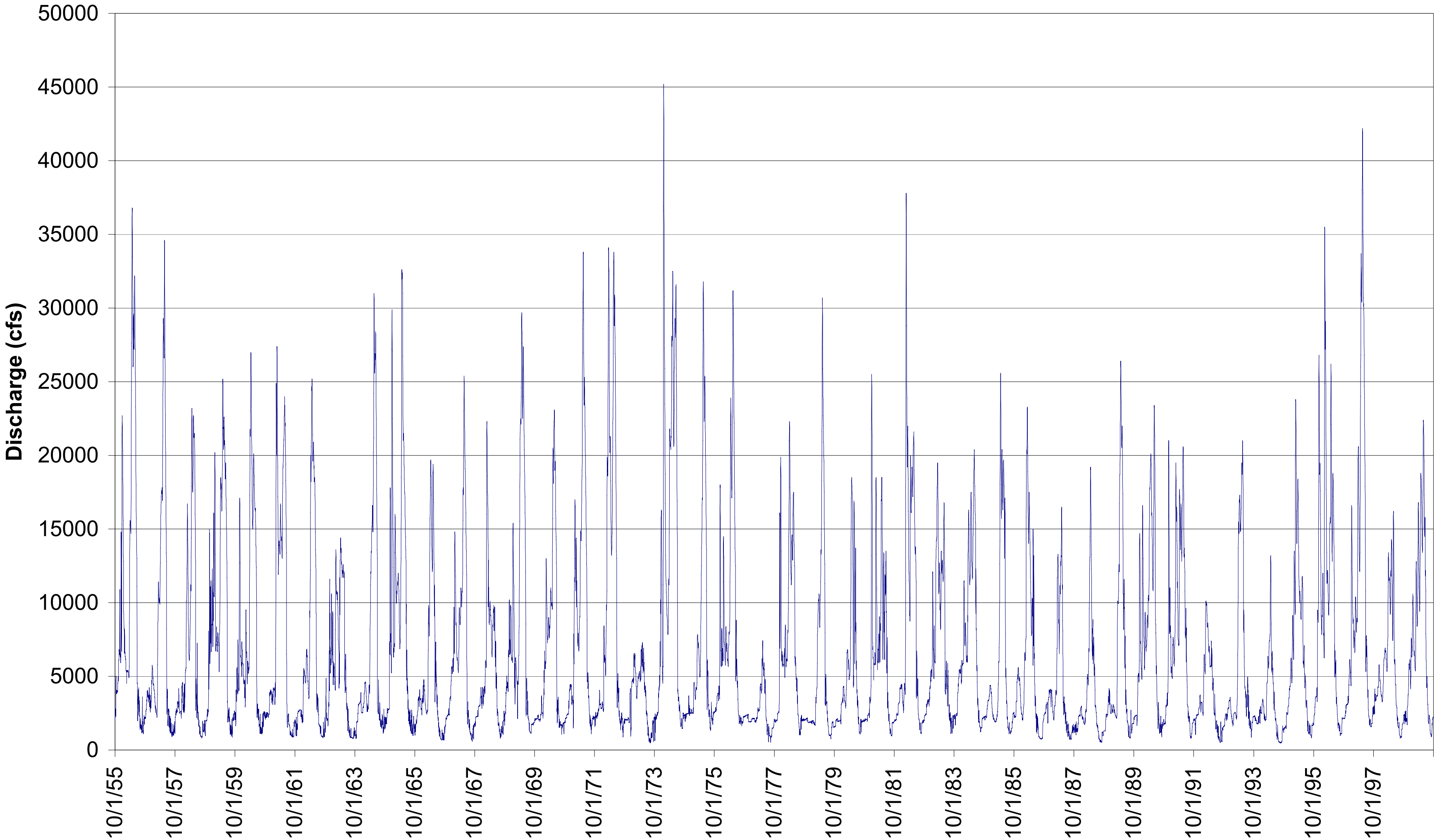
027-RI-CO-102Q
Coeur d'Alene Basin RI/FS
RI REPORT

Doc Control: 4162500.6615.05.a
Generation: 1

Spokane River Series
6/20/01

Figure 2.3.2-3

Mean Daily Discharge, Spokane River Near Spokane, USGS Station 12422500, Water Years 1956 to 1999



EPA REGION 10

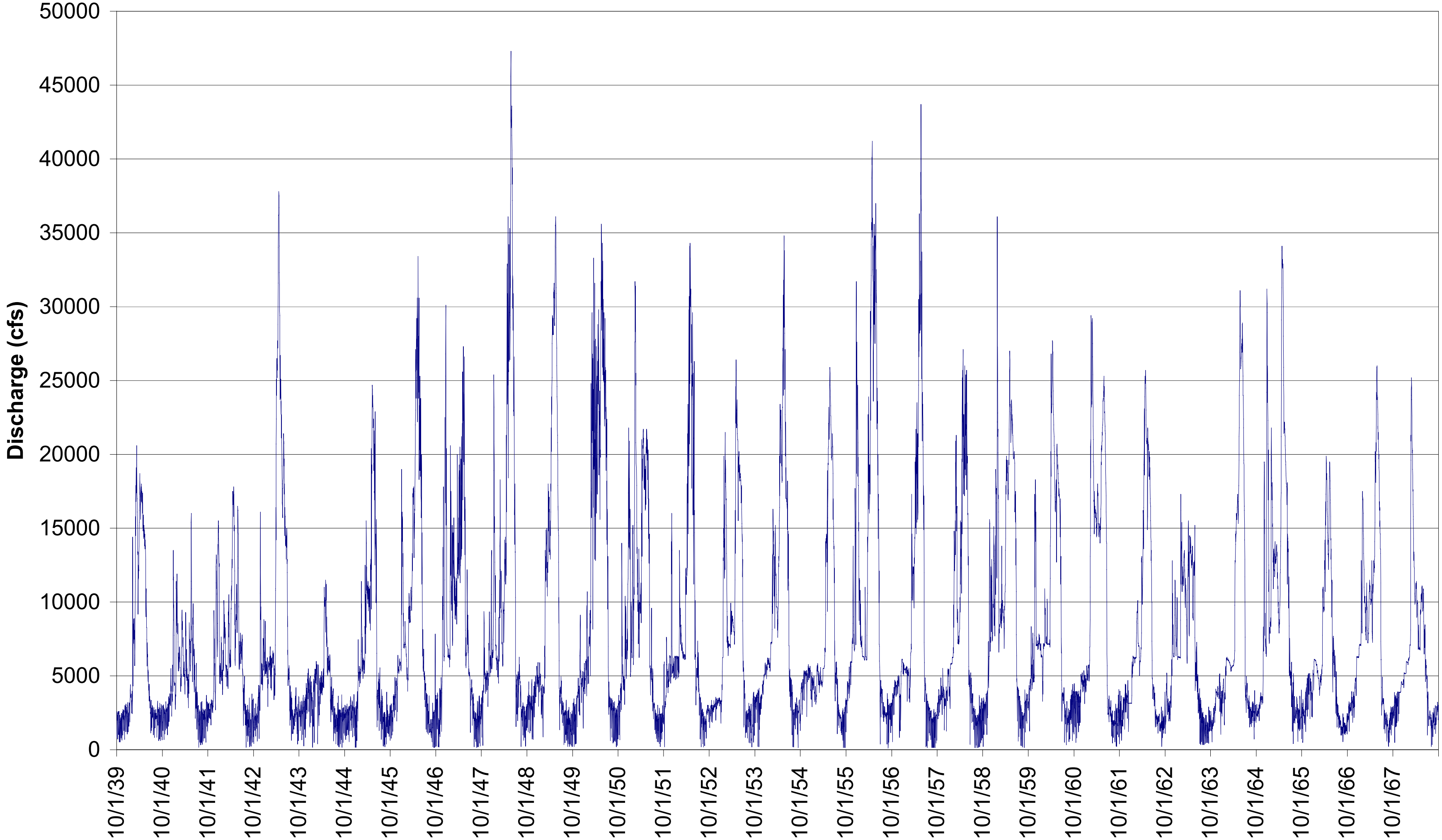
027-RI-CO-102Q
Coeur d'Alene Basin RI/FS
RI REPORT

Doc Control: 4162500.6615.05.a
Generation: 1

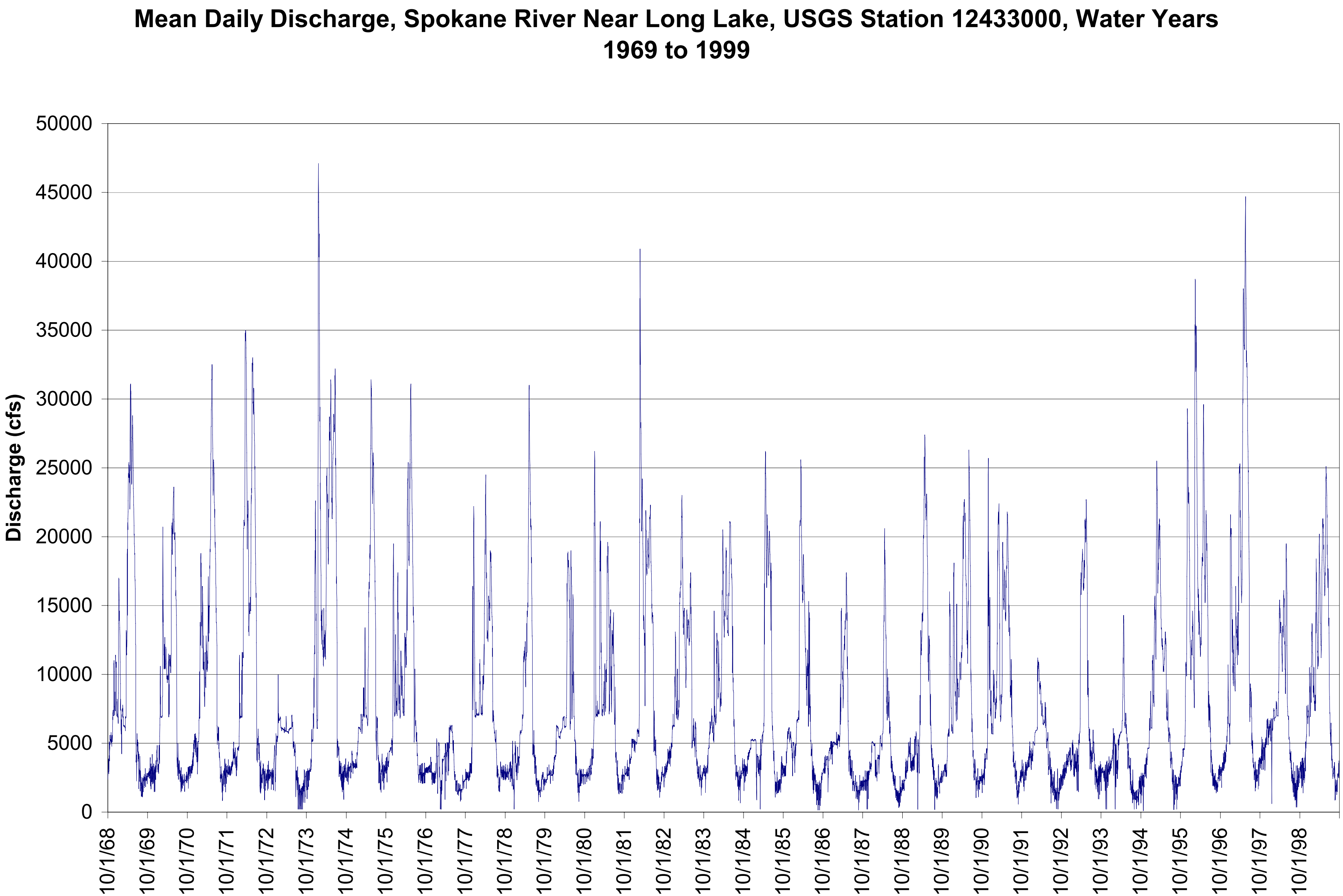
Spokane River Series
6/20/01

Figure 2.3.2-4

Mean Daily Discharge, Spokane River Near Long Lake, USGS Station 12433000, Water Years 1940 to 1968



EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS RI REPORT	Doc Control: 4162500.6615.05.a Generation: 1 Spokane River Series 6/20/01	**Figure 2.3.2-5**



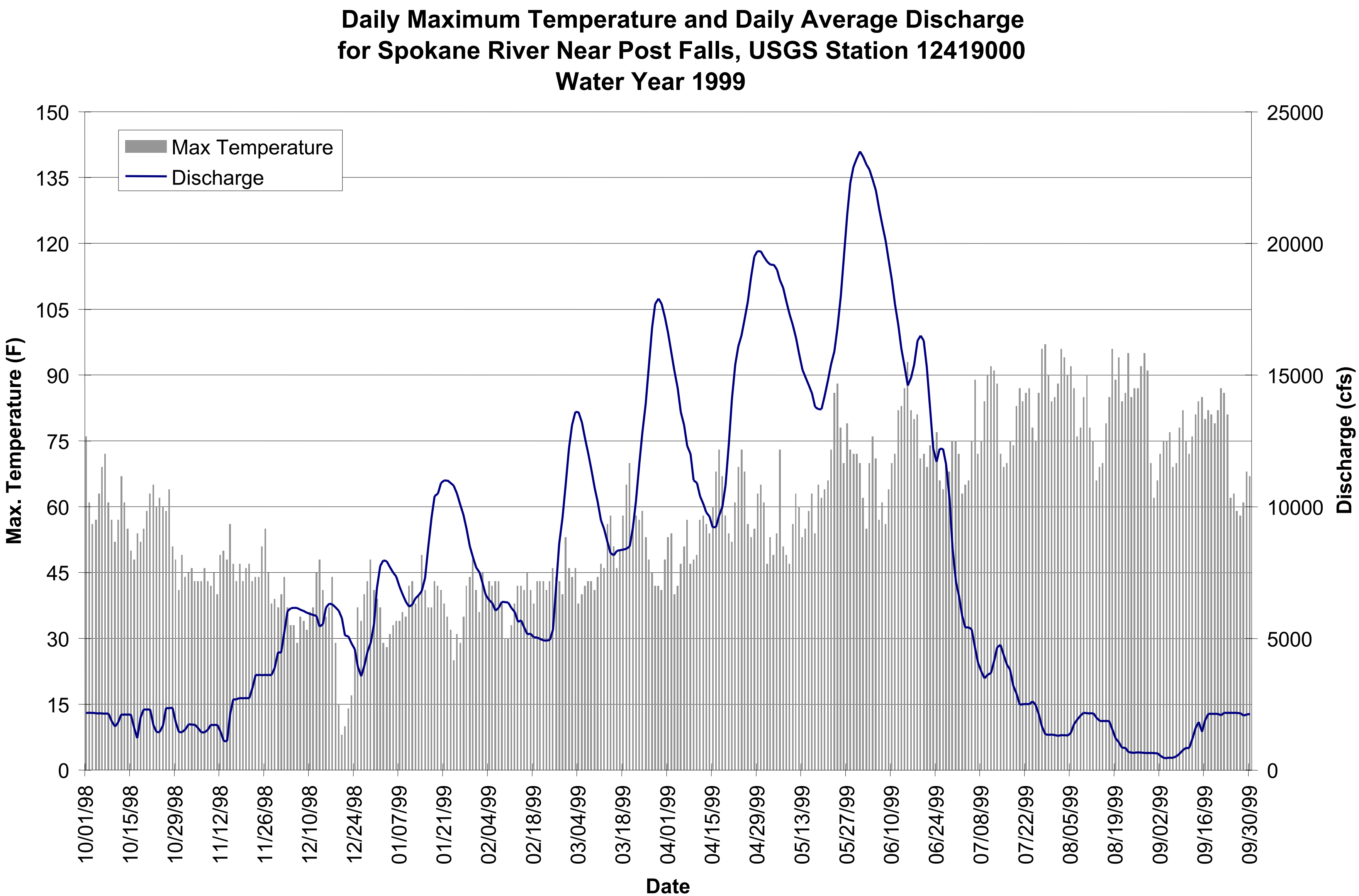
EPA REGION 10

027-RI-CO-102Q
Coeur d'Alene Basin RI/FS
RI REPORT

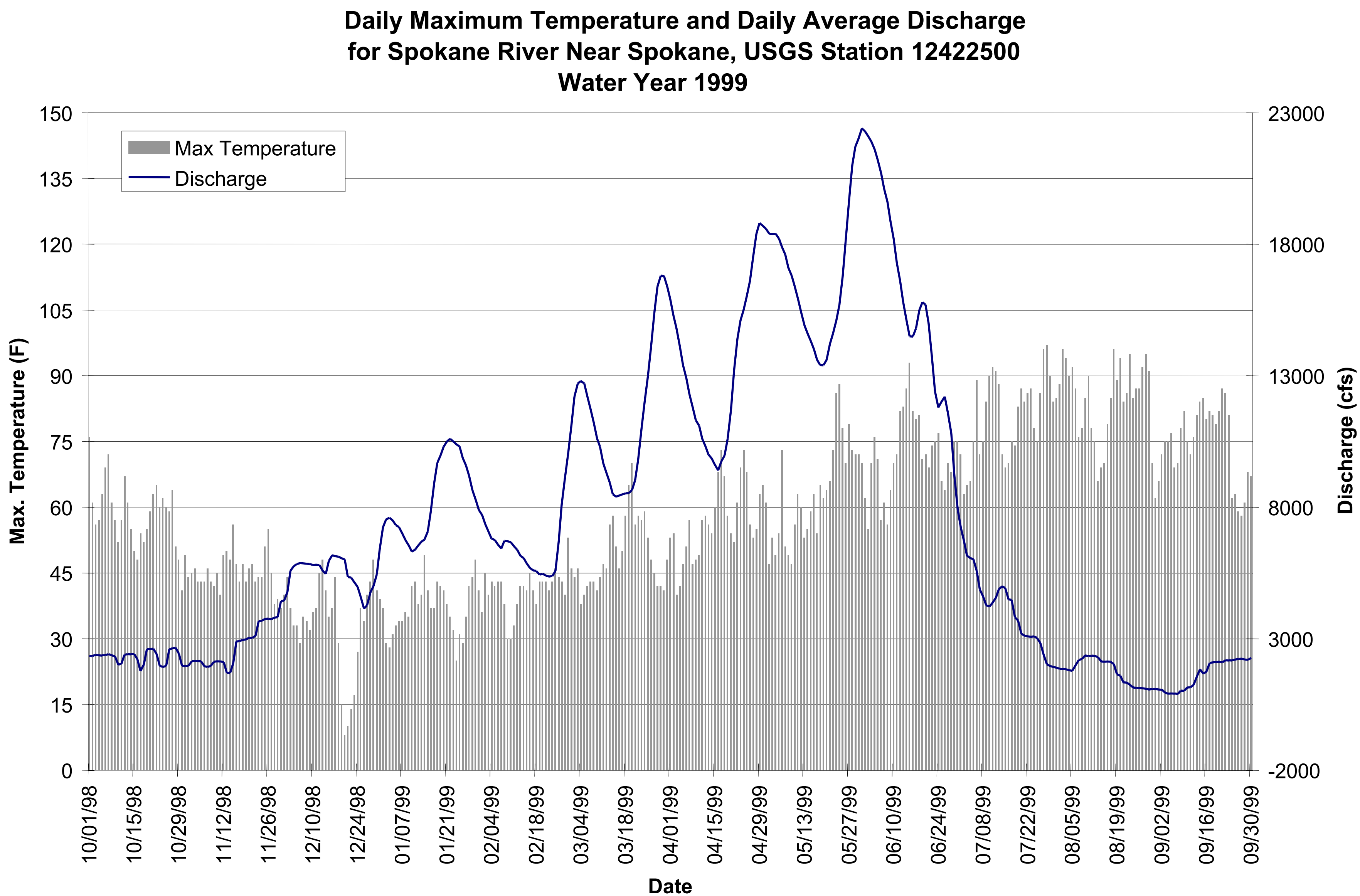
Doc Control: 4162500.6615.05.a
Generation: 1

Spokane River Series
6/20/01

Figure 2.3.2-6

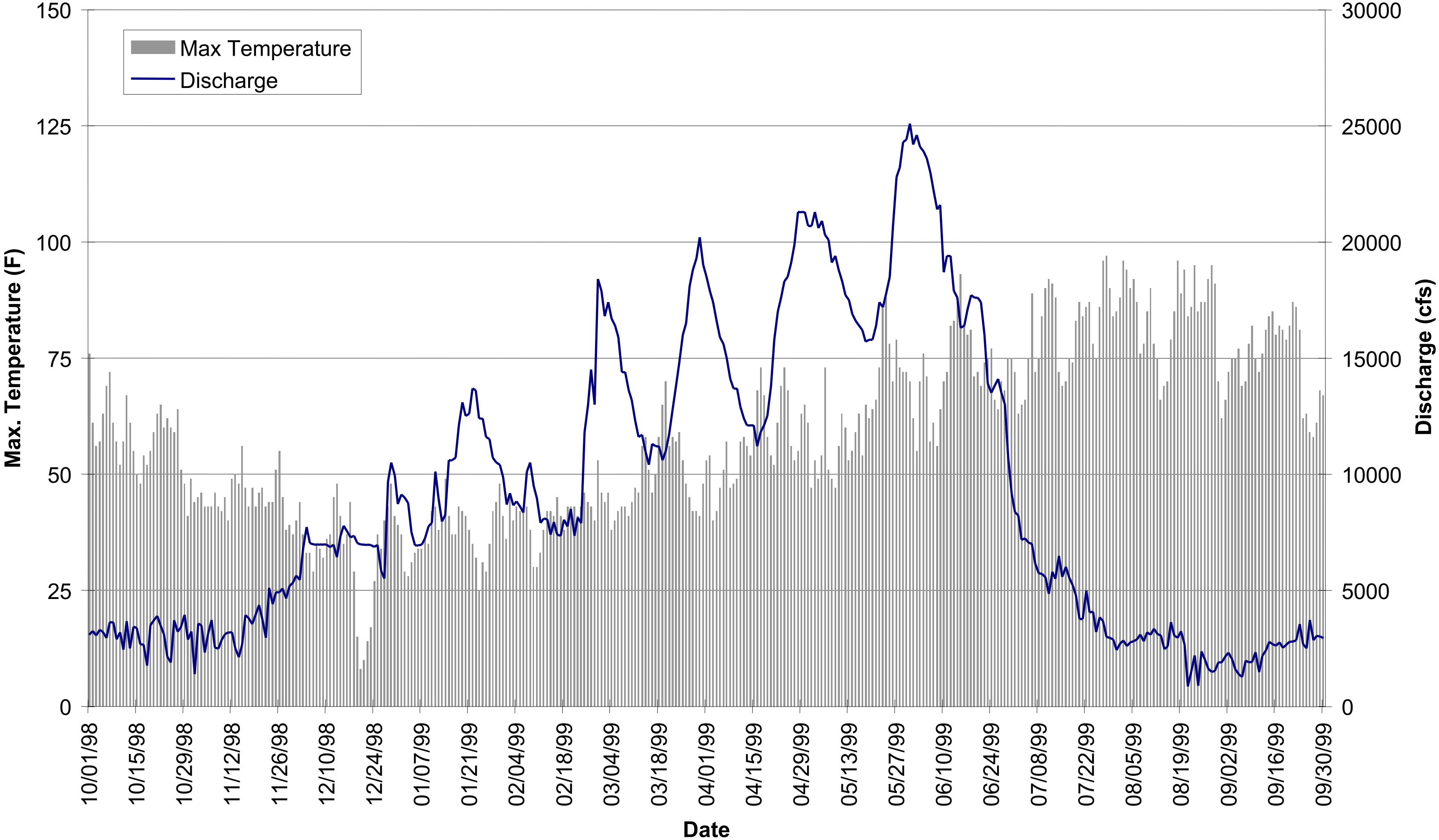


EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS RI REPORT	Doc Control: 4162500.6615.05.a Generation: 1 Spokane River Series 6/20/01	**Figure 2.3.2-7**



Daily Maximum Temperature and Daily Average Discharge
for Spokane River Near Spokane, USGS Station 12422500
Water Year 1999
Max Temperature
Discharge
Max. Temperature (F)
Discharge (cfs)
Date
150
135
120
105
90
75
60
45
30
15
0
23000
18000
13000
8000
3000
-2000
10/01/98
10/15/98
10/29/98
11/12/98
11/26/98
12/10/98
12/24/98
01/07/99
01/21/99
02/04/99
02/18/99
03/04/99
03/18/99
04/01/99
04/15/99
04/29/99
05/13/99
05/27/99
06/10/99
06/24/99
07/08/99
07/22/99
08/05/99
08/19/99
09/02/99
09/16/99
09/30/99

Daily Maximum Temperature and Daily Average Discharge for Spokane River Near Long Lake, USGS Station 12433000 Water Year 1999



EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS RI REPORT	Doc Control: 4162500.6615.05.a Generation: 1 Spokane River Series 6/20/01	Figure 2.3.2-9

Table 2.2-1
Water Quality Parameters in the Spokane Valley-Rathdrum Prairie Aquifer

	Nitrate -N (mg/L)	Nitrite-N (mg/L)	Ammonium -N (mg/L)	Ortho-phosphate (mg/L)	Chloride (mg/L)	Tempera-ture (°C)	Specific Conductance (µS/cm)	Hardness (mg CaCO3/L)
Minimum	0.00	0.00	0.00	0.00	0.4	6.4	73	68
Maximum	8.8	0.01	0.8	0.13	24	21.1	820	303
Mean	1.77	0.003	0.045	0.01	4.00	11.0	307	163
Standard Deviation	1.46	0.002	0.105	0.022	4.2	1.54	106	42

Sources: Vaccaro and Bolke (1983) except hardness, which is from Zheng (1995).
Vaccaro and Bolke (1983) data collected in 1977 and 1978; Zheng (1995) data collected in 1994.
Number of samples: Vaccaro and Bolke (1983), n=373; Zheng (1995), n=85
mg/L - milligram per liter
µS/cm - micro siemens per centimeter
CaCO3 - calcium carbonate

Table 2.2-2
Losing and Gaining Reaches in the Spokane River

Reach Description	Reach Classification	Loss to River in cfs
Reach 1 – from State Line Bridge to Harvard Road Bridge	Losing	47 to 307
Reach 2 – from Harvard Road Bridge to Barker Road Bridge	Losing	29 to 137
Reach 3 – from Barker Road Bridge to Sullivan Road Bridge	Transitional	127 to - 126 (gain)
Reach 4 – Sullivan Road Bridge to Trent Avenue Bridge	Gaining	88 to -30 (gain)
Reach 5 – from Trent Avenue Bridge to Plantes Ferry Footbridge	Gaining	53 to -30 (gain)

Sources: Christina Gearhart and John Buchanan. 2000.
cfs - cubic feet per second

Table 2.3-1
Estimated Recurrence Intervals, Spokane River Near Otis Orchard
Downstream of Post Falls Dam

Recurrence Interval (Years)	Flood Insurance Study Spokane River near Otis Orchard Estimated Peak Flow (cfs)
2	not available
5	not available
10	37,500
25	not available
50	47,000
100	52,000

cfs - cubic feet per second

Table 2.3-2
Estimated Recurrence Intervals, Spokane River
Downstream of Spokane City Limits

Recurrence Interval (Years)	Flood Insurance Study Spokane River Downstream of Spokane City Limit Estimated Peak Flow (cfs)
2	not available
5	not available
10	38,000
25	not available
50	47,600
100	52,700

cfs - cubic feet per second

Table 2.3-3
Precipitation Summary and Discharge Comparison for Water Year 1999
Spokane River, Washington
NOAA Cooperative Station 457938

Climate Indicators	Monthly Totals												Total Annual
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
Spokane WSO Airport Total Precipitation (in.)	0.3	3.8	3.3	1.9	3.3	0.7	0.4	0.7	1.4	0.1	1.1	0.0	16.9
Spokane WSO Airport Total Snowfall (in.)	0	0.8	11.2	8.7	14.7	3.8	2.7	0.6	0.0	0.0	0.0	0.0	42.5
Average Precipitation for Period of Record (in.)	0.8	1.2	2.1	2.2	2.0	1.6	1.4	1.1	1.4	1.2	0.6	0.6	16.1
Average Snowfall for Period of Record (in.)	0.0	0.3	5.4	11.2	13.0	7.7	3.4	0.5	0.1	0.0	0.0	0.0	41.6
Mean Monthly Discharge (cfs) (Spokane River near Post Falls, Idaho)	1,955	2,435	5,500	8,488	6,276	11,889	13,697	17,583	16,274	3,480	1,349	1,480	7,534
Mean Monthly Discharge (cfs) (Spokane River near Spokane, Washington)	2,300	2,730	5,487	8,290	6,540	11,475	13,295	16,848	15,960	4,114	1,731	1,649	7,533
Mean Monthly Discharge (cfs) (Spokane River near Long Lake, Washington)	3,120	3,603	7,217	10,072	9,421	14,513	15,717	19,245	17,978	5,178	2,486	2,454	9,241

cfs - cubic feet per second

3.0 SEDIMENT TRANSPORT PROCESSES

The physical processes of rain falling on soil, runoff from snowmelt or precipitation, channel bank and bed erosion, or mass movements incorporate sediment into streams of water. Water in streams transports, deposits, and sorts the delivered sediment based on the stream energy, discharge, and size and quantity of sediment.

Sediment transport by streams is a natural process; however, human activities such as logging, road building, urbanization, or land clearing can significantly increase the rate at which sediment transport occurs. For instance, land clearing provides exposed soil and rock that may be subject to erosion. Further, this disturbance may decrease the amount of water storage in the soil, increasing runoff rates and providing additional surface water and energy for sediment transport.

The rate at which sediment passes through a cross section of a stream system is referred to as the sediment yield. For purposes of this discussion, sediment yield will be referred to in units of tons per square mile per year. This annual sediment yield may be broken down into components that describe the method of transport, suspended load and bed load. Suspended load consists of particles small and light enough to be carried downstream in suspension by shear and eddy forces in the water column. Bed load consists of larger and heavier particles that move downstream by rolling sliding or hopping on the channel bed (Dunne and Leopold 1978).

All sediment motion downstream is dictated by the shear and gravitational forces acting at a given time and place within the channel. For sediment transport purposes, gravitational forces are essentially constant. Shear forces, however, are dynamic through space and time and are dependent upon the location, depth of water, and slope of the water surface. Sediment transport occurs at even the smallest of stream channel discharge but the majority of movement occurs during moderate to high discharge when shear forces are greatest (Leopold et al. 1992).

Much of the sediment derived in or introduced to the Spokane River is transported and deposited in reservoirs or locally along the shorelines by the free-flowing reaches along its length. The largest sediment sources to the Spokane River are remobilization of channel bed material, bank erosion, and tributary channels. Most of the discharge in the Spokane River is derived from the outlet of Coeur d'Alene Lake. Groundwater recharge contribution also is prominent and is particularly important in the summer and fall. This lake provides a low energy environment where much of the sediment derived from upstream sources is deposited. Some of the smallest and lightest particles remain suspended through the lake and are transported to the Spokane River.

As part of an evaluation of downstream impacts from metals released from the Coeur d'Alene River Basin to the Spokane River Basin, the USGS collected samples from six gravity cores (Grosbois et al. 2000). One core was collected from the upper Spokane River, three cores from Long Lake, and two from the Spokane River Arm of Lake Roosevelt. Subsurface sediments were found to be enriched in antimony, arsenic, cadmium, lead, mercury, and zinc relative to background concentrations. Based on ^{137}Cs dating, trace element enrichment began in Long Lake between 1900 and 1920, the same time range as enrichment observed in Coeur d'Alene Lake sediments and the completion of the Long Lake dam (1913). In the most downstream part of the Spokane River Basin (Spokane River Arm of Lake Roosevelt), enrichment began later, between 1930 and 1940. The temporal difference in enrichment between Long Lake and the River Arm may reflect the latter's greater distance from the Coeur d'Alene River Basin; however, the difference is more likely the result of the completion of Grand Coulee Dam (1934 to 1941) which formed Lake Roosevelt, backed up the Spokane River, and increased water levels in the River Arm by about 30 meters (Grosbois et al. 2000).

3.1 AVAILABLE INFORMATION

Aerial photographs from the USGS (USGS 1973-1983), Washington State Department of Natural Resources (WSDNR 1989), and Washington State Department of Transportation (WSDOT 1979) were available for review. USGS sediment gaging data are only available for Hangman Creek, not for the Spokane River; therefore, estimates of sediment yield for the Spokane River are not included in this discussion.

3.2 ANALYSES

The USGS, WSDNR and WSDOT aerial photographs were reviewed to describe the Spokane River. This review and interpretation focused on morphologic features indicating stream instability, channel migration, channel aggregation or degradation and other features that may contribute or trap sediment in the system.

3.2.1 Segment SpokaneRSeg01

Segment SpokaneRSeg01 has approximately 14.2 miles of mapped channel, including reservoirs, along it length. Through this segment, the Spokane River flows from the outlet of Coeur d'Alene Lake to the Washington-Idaho border. From the outlet of Coeur d'Alene Lake to the Post Falls Dam, the Spokane River is essentially a continuation of Coeur d'Alene Lake. Downstream of the

Post Falls Dam to the downstream end of segment SpokaneRSeg01, the river channel is 200 to 400 feet in width. Occasional gravel bars and braiding in the reach near the State line are visible in the USGS photographs indicating depositional areas of fine-grained materials. Results of recent sampling by the USGS and URS in this area are presented in Section 4.0. The source of this gravel is in-place bed material from the Spokane River, as much of the gravel from the Coeur d'Alene and St. Joe River watersheds are deposited in the Lower Coeur d'Alene River or Coeur d'Alene Lake. Bare soil adjacent to the channel located 0.7 to 1.0 mile upstream of the I-90 bridge may indicate bank erosion. Other eroding banks probably occur through this segment. Sediment sources in this segment are channel bed remobilization, bank erosion and sediment from the outlet of Coeur d'Alene Lake.

3.2.2 Segment SpokaneRSeg02

Segment SpokaneRSeg02 has approximately 42.2 miles of mapped channel and reservoirs along its length. The Spokane River from the Washington-Idaho border to Greenacres, Washington has similar character to Segment SpokaneRSeg01. Near Greenacres, the channel narrows to 150 to 200 feet wide and becomes increasingly entrenched from the surrounding landscape. Occasional bars and exposed soil on slopes adjacent to the channel are visible in the photographs reviewed from the upstream end of segment SpokaneRSeg02 to Myrtle Point.

From Centennial Trail Bridge near Myrtle Point to the Upriver Dam in Spokane, the channel forms a backwater caused by the dam. Much of the sediment derived in segments SpokaneRSeg01 and SpokaneRSeg02 likely is deposited in this reach due to the lower energy environment in the backwater of the dam.

From the Upriver Dam down to the Upper Falls and Monroe Street Dam facilities in Spokane, the channel is in the backwater caused by these dams. Additional deposition of sediment may occur over this reach but is probably small due to deposition above Upriver Dam and low sediment load.

The Spokane River from the Monroe Street Dam to the mouth of Hangman Creek flows through the City of Spokane in a gorge approximately 200 feet deep. Likely sediment sources in this reach are bank erosion, urban runoff, and channel bed remobilization.

Hangman Creek, an unregulated tributary, joins the Spokane River approximately 1.7 miles downstream of the Monroe Street Bridge. The Spokane County Conservation District completed sediment transport measurements and estimated the sediment yield for water years 1998 and 1999 (SCCD 2000). This report indicates that for water year 1998 the total sediment discharge consisted of an estimated 35,000 tons of suspended discharge and 17,000 tons of bedload discharge. For water year 1999, the total sediment discharge consisted of an estimated 188,000 tons of suspended discharge and 23,000 tons of bedload discharge. As indicated in this report, Hangman Creek is a significant source of sediment to the Spokane River.

From the confluence with Hangman Creek to the Seven Mile Road Bridge, the Spokane River is contained within a gorge approximately 200 feet deep. Terraces adjacent to the channel are also situated in the bottom of the gorge. Likely sediment sources in this reach are channel bed remobilization and bank erosion.

The Spokane River from the Seven Mile Road Bridge to Ninemile Falls is backwatered in the Ninemile Reservoir. Deposition of sediment from the Spokane River likely occurs in Ninemile Reservoir.

From Ninemile Falls to the downstream end of segment SpokaneRSeg02, Long Lake, the Spokane River is contained within a gorge approximately 200 feet deep. Likely sediment sources include channel bed remobilization and bank erosion.

Sediment derived in segments SpokaneRSeg01 and 02 would be expected to accumulate in the lower energy environments of the reservoirs within these segments.

3.2.3 Segment SpokaneRSeg03

Segment SpokaneRSeg03 has approximately 54.5 miles of mapped channel and reservoirs along the length. The Little Spokane River joins the Spokane River near the upstream boundary of segment SpokaneRSeg03. The Little Spokane River is unregulated and is a source of sediment to the Spokane River. From the upstream boundary of segment SpokaneRSeg03 to the Long Lake Dam, the river is contained in the Long Lake Reservoir. Much of the sediment transported to segment SpokaneRSeg03 is deposited in the Long Lake Reservoir.

From Long Lake Dam to Little Falls Dam, the Spokane River is contained in a gorge with most of the length in the backwater from the Little Falls Dam. Downstream of Little Falls Dam, the Spokane River flows into Benjamin Lake and the Spokane Arm of Lake Roosevelt to the downstream boundary of segment SpokaneRSeg03 at Fort Spokane, Washington.

3.3 SUMMARY

Based on review of the aerial photographs, sediment transport throughout the Spokane River is controlled by dams and reservoirs. Some fine-grained sediment is probably transported through the reservoirs; however, the majority of sediment is likely deposited in the reservoirs throughout the length of the Spokane River.

These observations were based on a review of the available photographs, at the time of review. Not all potential sediment sources were identified as potential sediment sources literally cover the entire watershed. Primary sources were identified based on review of the available information.

4.0 NATURE AND EXTENT OF CONTAMINATION

The nature and extent of contamination and mass loading in the three segments of the Spokane River are discussed in this section. Section 4.1 describes chemical concentrations found in environmental media, including horizontal and vertical extent. For each watershed segment, the discussion includes remedial investigation data chemical analysis results; and comparison of chemical results to selected screening levels. In Section 4.2, preliminary estimates of mass loading are presented.

4.1 NATURE AND EXTENT

The nature and extent of the ten metals of potential concern identified in Part 1, Section 5.1 (antimony, arsenic, cadmium, copper, iron, lead, manganese, mercury, silver, and zinc) in surface soil, subsurface soil, sediment, and surface water are discussed in this section. Groundwater samples were not collected for this investigation. Locations with metals detected in any matrix at concentrations 1 times (1x), 10 times (10x) and 100 times (100x) the screening level were identified and presented in the following data summary tables. The magnitudes of exceedance (10x and 100x) were arbitrarily selected to delineate areas of contamination.

Historical and recent investigations at areas within the study area are listed and summarized in Part 1, Section 4. Data source references are included as Attachment 1. Chemical data collected in the Spokane River and used in this evaluation are presented in Attachment 2. Data summary tables include sampling location, data source reference, collection date, depth, and reported concentration. Screening level exceedances are highlighted. Sampling locations are shown on Figures 4.1-1 through 4.1-6.

The nature and extent of contamination were evaluated by screening chemical results against applicable risk-based screening criteria and available background concentrations. Screening levels are used in this analysis to identify source areas and media (e.g., soil, sediment, groundwater, and surface water) of concern that will be evaluated in the feasibility study (FS).

Statistical summaries for each metal in surface soil, subsurface soil, sediment and surface water are included as Attachment 3 and discussed in the subsections below. The summaries include the number of samples analyzed; the number of detections; the minimum and maximum detected concentrations; the average and coefficient of variation; and the screening level (SL) to which the detected concentration is compared. Proposed screening levels were compiled from available federal numeric criteria (e.g., National Ambient Water Quality Criteria), regional preliminary remediation goals (PRGs) (e.g., U.S. EPA Region IX PRGs), regional baseline or background studies for soil, sediment, and surface water, and other guidance documents (e.g., National Oceanographic and Atmospheric Administration freshwater sediment screening values). The screening level selection process is discussed in detail in Part 1, Section 5.1.

The following sections present segment-specific sampling efforts and results according to matrix type. Given the extensive geographic range of the Coeur d'Alene Basin, sampling efforts were focused on areas of potential concern; therefore, more samples were collected from known mining-impacted areas near the river than from other areas within the watershed.

4.1.1 Segment SpokaneRSeg01

4.1.1.1 Surface Soil

Thirty-eight surface soil samples were collected and analyzed for total metals in segment SpokaneRSeg01. Total metal concentrations of lead and zinc in surface soil exceeded 10x the screening levels.

4.1.1.2 Subsurface Soil

Twenty-eight subsurface soil samples were collected and analyzed for total metals. Arsenic, lead, and zinc were detected at concentrations greater than 10x the screening levels. Lead was detected at three locations at concentrations greater than 100x the screening levels.

4.1.1.3 Sediment

One hundred and seventy one sediment samples were collected and analyzed for total metals. Concentrations of cadmium, lead, manganese, and zinc exceeded 10x the screening level. Concentrations of lead at five locations exceeded 100x the screening level.

4.1.1.4 Surface Water

Twenty-five surface water samples were collected and analyzed for total and dissolved metals in segment SpokaneRSeg01. Concentrations of total copper and zinc exceeded 1x the screening levels. Concentrations of dissolved cadmium and zinc exceeded 1x the screening levels.

4.1.2 Segment SpokaneRSeg02

4.1.2.1 Surface Soil

Seven surface soil samples were collected and analyzed for total metals. Concentrations of lead and zinc exceeded 10x the screening levels.

4.1.2.2 Subsurface Soil

Sixty-three subsurface soil samples were collected and analyzed for total metals. Concentrations of lead and zinc exceeded 10x the screening levels.

4.1.2.3 Sediment

One hundred and nine sediment samples were collected and analyzed for total metals. Concentrations of cadmium, lead, and zinc exceeded 10x the screening levels.

4.1.2.4 Surface Water

Thirty-two surface water samples for total metals and 36 surface water samples for dissolved metals were collected and analyzed within segment SpokaneRSeg02. Concentrations of total zinc exceeded 1x the screening level. Concentrations of dissolved cadmium, lead, and zinc exceeded 1x the screening levels.

4.1.3 Segment SpokaneRSeg03

4.1.3.1 Subsurface Soil

Eighty-four subsurface soil samples were collected and analyzed for total metals. Total metal concentrations in subsurface soil were all less than 10x the screening levels.

4.1.3.2 Surface Water

Ten surface water samples for total metals and 12 surface water samples for dissolved metals were collected and analyzed in segment SpokaneRSeg03. Concentrations of total zinc exceeded 1x the screening level. The concentration of dissolved cadmium at one location exceeded 1x the screening level.

4.2 SURFACE WATER MASS LOADING

In Part 1of this report, (Setting and Methodology, Section 5.3.1), the concept of mass loading and its use in the remedial investigation was presented. Section 4.2 of the Canyon Creek Nature and Extent further discussed the use of the plotting discrete sampling events versus the probabilistic analysis of the mass loading data in Fate and Transport.

This section presents the discrete mass loading measurements made during several low- and high-flow sampling events. The locations sampled during each event are plotted on a map of the watershed (Figures 4.2-1 through 4.2-6). Each sampling location shows the cumulative mass loading of lead or zinc and the difference in mass load from the next upstream location. The difference in mass load is indicated on the maps by the term "delta." The events were selected to show variations in mass loading throughout the stream system relative to source areas. The events selected are not intended to represent all the available mass loading data. The remainder of this section presents the indicator metal correlation and selected maps with a discussion of discrete sampling events on a watershed basis.

4.2.1 Indicator Metal Correlation

In Section 4.2 of the Canyon Creek Watershed Nature and Extent, the correlation of chemical concentrations for 8 chemicals of potential concern (COPCs) are evaluated for total lead and dissolved zinc. These two metals appear to be reasonable indicators of the other chemicals of potential concern. The following mass loading discussion is limited to total lead and dissolved zinc.

4.2.2 Spokane River Watershed Mass Loading

Of the available sampling data, three sampling events were selected and mapped. Table 4.2-1 summarizes the sampling events, sampling locations and calculated mass loads for total lead and dissolved zinc. The flow events used were May 1999 (Figures 4.2-1 and 4.2-4), June 1999 (Figures 4.2-2 and 4.2-5) and September 1999 (Figures 4.2-3 and 4.2-6). As shown in Table 4.2-1, flows for the May 1999 and June 1999 sampling events ranged from 14,100 cfs to 16,200 cfs. The September 1999 sampling event had a range of flows from 444 cfs to 3,350 cfs. The following sections discuss observations made from plotting the mass loading data.

4.2.2.1 Total Lead Mass Loading

Loading observations are as follows:

As shown on Figures 4.2-1, 4.2-2, and 4.2-3, the total lead loads are the highest during the May sampling and have declined by the September sampling. During the May sampling, the lead mass loading ranged from 314 pounds per day at the Washington State line to 344 pounds per day at the City of Spokane. There is an unexplained loss of 100 pounds per day at location SR70. The September 1999 event reflects the decrease in flows. The lead loading drops to a range of less than 1 pound per day near Post Falls to 3 pounds per day at the city of Spokane. The highest load in September was 4 pounds per day near the Washington State line.

4.2.2.2 Dissolved Zinc Mass Loading

Loading observations are as follows:

As shown on Figures 4.2-4, 4.2-5, and 4.2-6, the dissolved zinc loads are the highest during the May sampling and have declined by the September sampling. During the May sampling the zinc mass loading ranged from 5,420 pounds per day at the Washington State line to 6,026 pounds per day at the City of Spokane. There is an unexplained loss of 268 pounds per day at location SR70, also in the city of Spokane. The June sampling event also shows declining zinc loading in the city of Spokane.

The September 1999 sampling event reflects the decrease in flows. The zinc loading decreases to 79 pounds per day measured near Post Falls and 39 pounds per day at the city of Spokane (SR75). The highest loads in September were 82 pounds per day near the Washington State line (SR55) and 90 pounds per day near the dam on Long Lake (SR85).

4.2.2.3 Groundwater Mass Loading

Groundwater conditions (e.g., flow and metals concentrations) have not been adequately characterized to develop mass loading information.

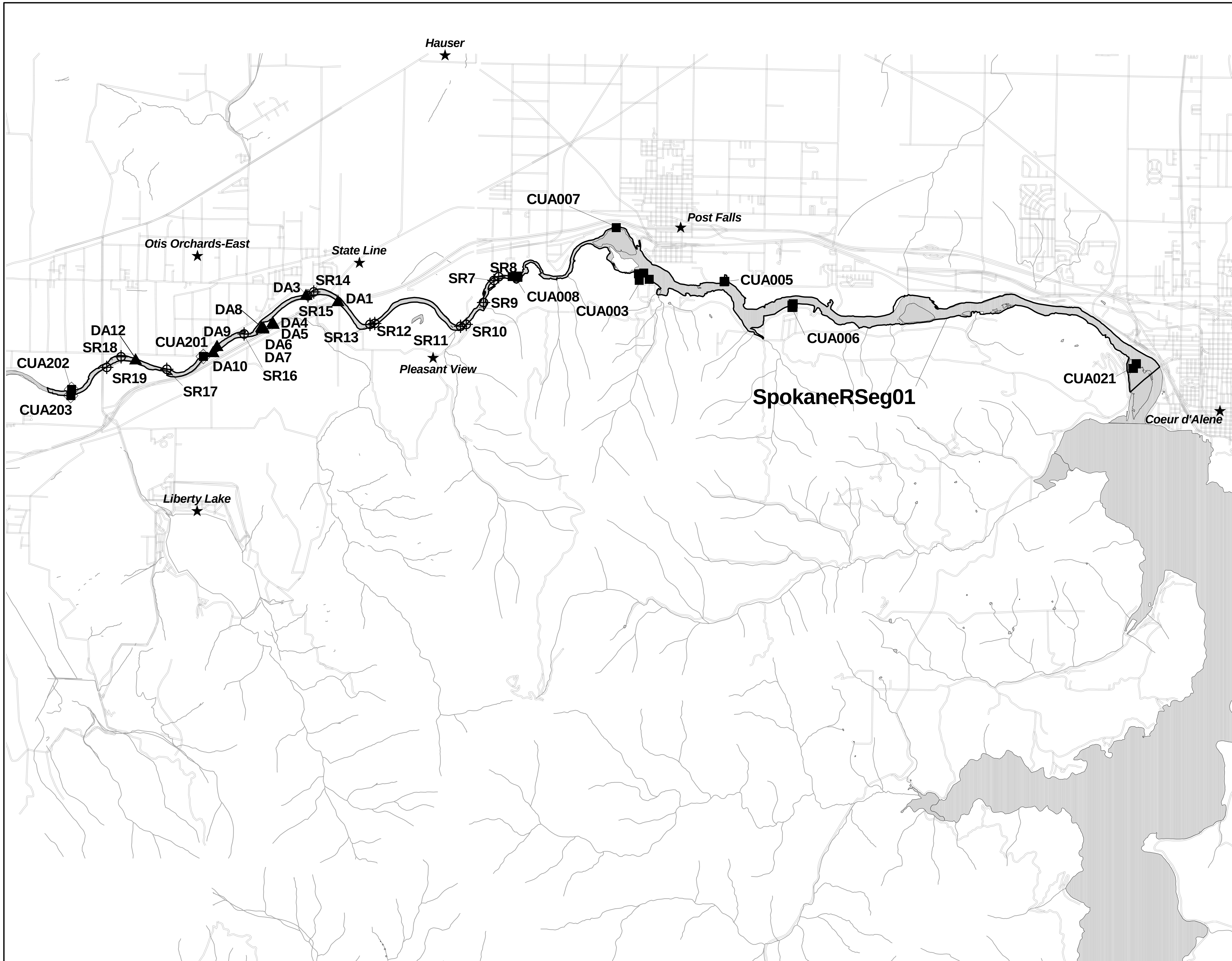


Figure 4.1-1
Spokane River Segment SpokaneRSeg01
Soil/Sediment Sampling Locations

LEGEND

- Common Use Area Sampling Location
- Hand Auger Sampling Location
- River Sampling Location
- Depositional Area Location
- Stream
- Road
- Interstate 90
- City
- Spokane River Segment 1

Location Map

NOTES

1) Base map coverages obtained from the Coeur d'Alene Tribe, URS Greiner Inc., CH2M HILL, and the Bureau of Land Management.

2) Sampling Locations from URS Greiner Woodward Clyde Technical Data Management Database as of 03/29/00

N

SCALE 1:84,000

0 0.5 1 Miles

027-RI-CO-102Q
Coeur d'Alene Basin RI/FS
RI REPORT

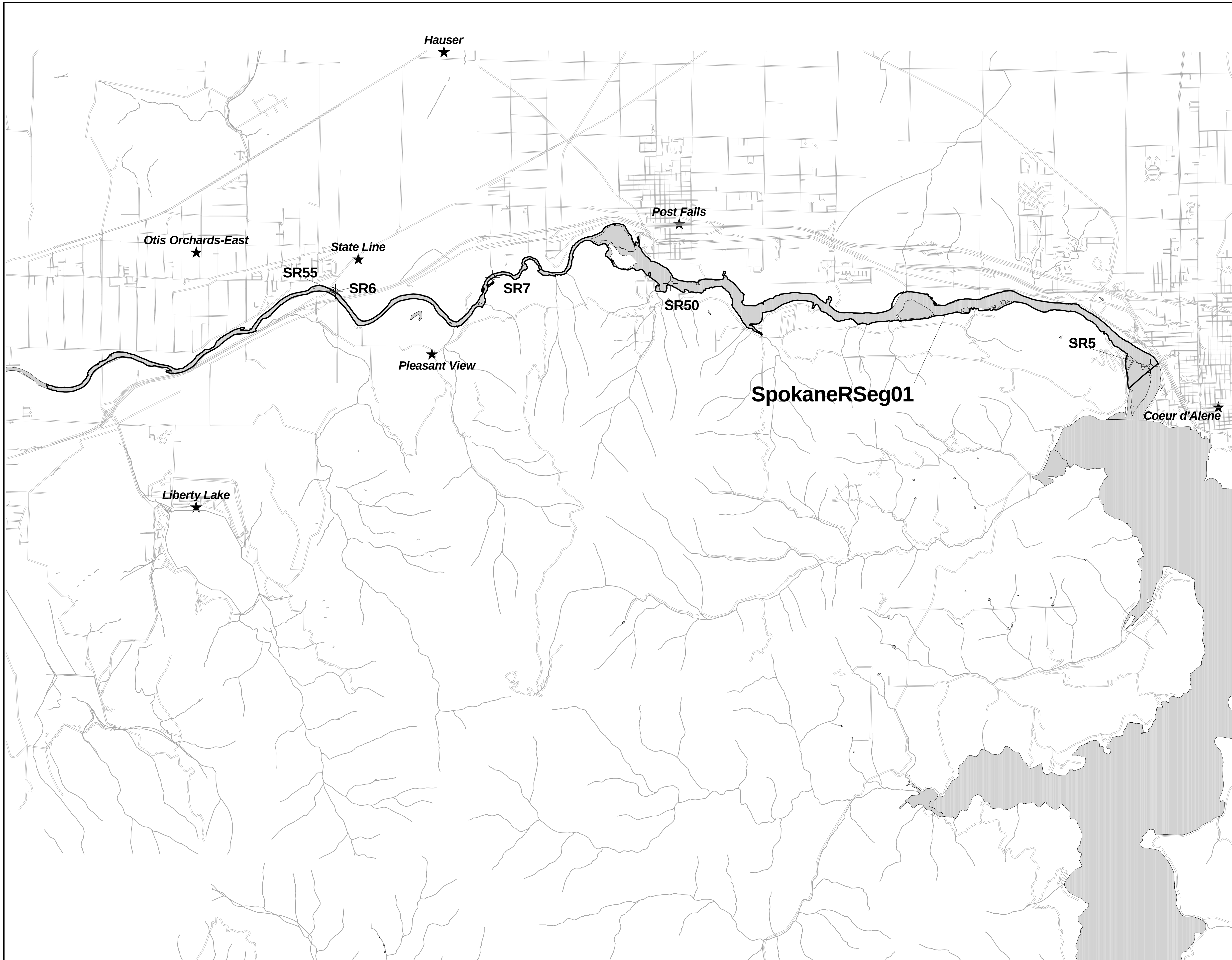
EPA REGION 10

Doc Control 4162500.6615.05.a
Generation 1
n:\Projects\RI_FS\Spokane River|
Spokane River.apr
V: Spokane River Seg01 - Soil/Sediment
E: Spokane River Seg01
L: Final RI Spokane River Seg01 - Soil/Sediment
7/13/01

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: July 13, 2001

Figure 4.1-2
Spokane River Segment SpokaneRSeg01
Surface Water Sampling Locations



LEGEND

- River Sampling Location
- Stream
- Road
- Interstate 90
- City
- Spokane River Segment 1

Location Map

NOTES

1) Base map coverages obtained from the Coeur d'Alene Tribe, URS Greiner Inc., CH2M HILL, and the Bureau of Land Management.

2) Sampling Locations from URS Greiner Woodward Clyde Technical Data Management Database as of 03/29/00

SCALE 1:84,000

0 0.5 1 Miles

027-RI-CO-102Q
Coeur d'Alene Basin RI/FS
RI REPORT

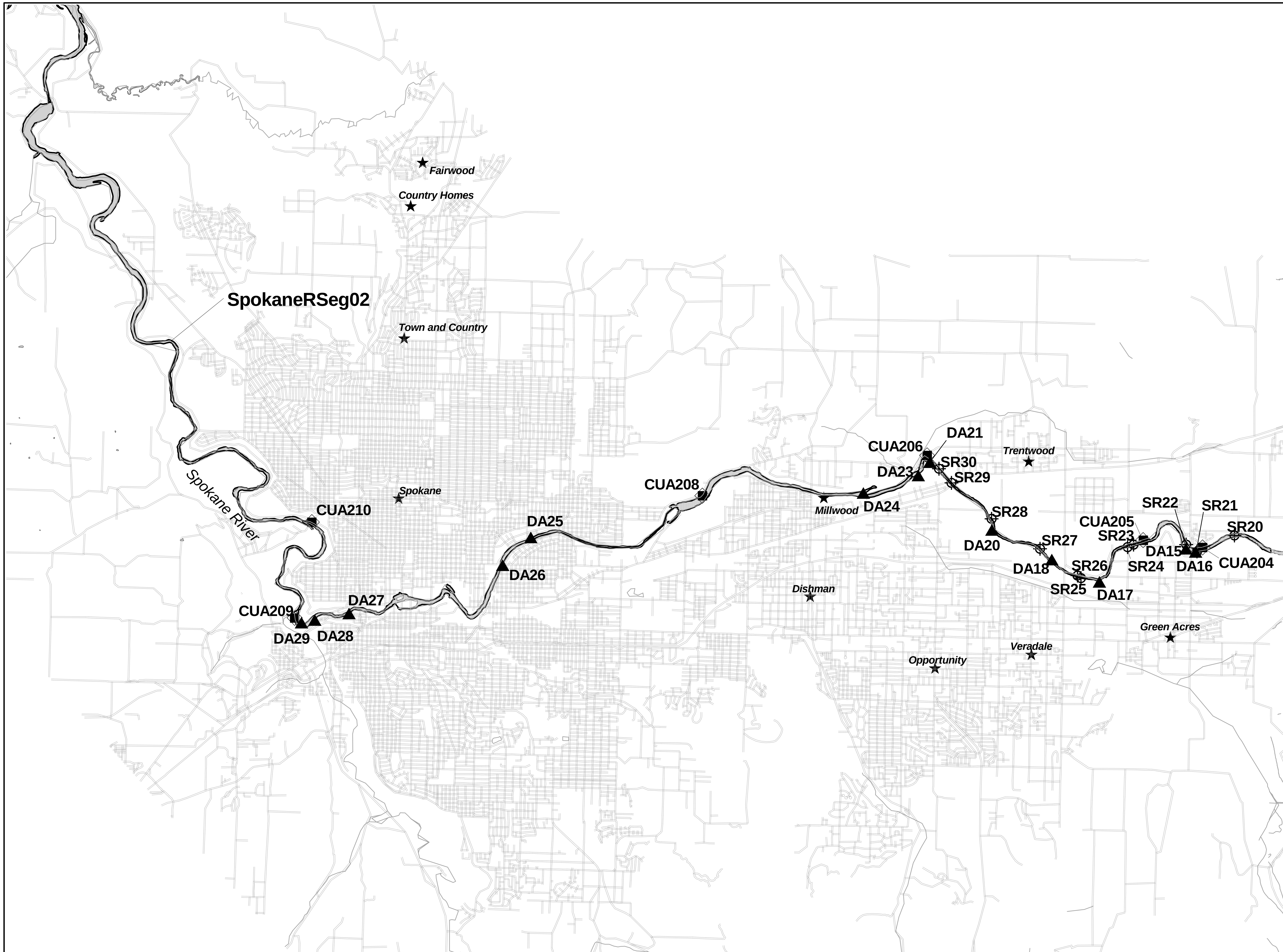
EPA REGION 10

Doc Control 4162500.6615.05a
Generation 1
n:\Projects\RI_FS\Spokane River|
Spokane River Fig 4.1-2
V: Spokane River Seg01 - Surface Water
E: Spokane River Seg01
L: Final RI Spokane River Seg01 - Surface Water
7/03/01

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: July 6, 2001

Figure 4.1-3
Spokane River Segment SpokaneRSeg02
Soil/Sediment Sampling Locations



LEGEND

- Common Use Area Sampling Location
- Hand Auger Sampling Location
- River Sampling Location
- Depositional Area Location
- Stream
- Road
- Interstate 90
- City
- Spokane River Segment 1

Location Map

NOTES

1) Base map coverages obtained from the Coeur d'Alene Tribe, URS Greiner Inc., CH2M HILL, and the Bureau of Land Management.

2) Sampling Locations from URS Greiner Woodward Clyde Technical Data Management Database as of 03/29/00

N

SCALE 1:100,000

0 0.5 1 Miles

027-RI-CO-102Q
Coeur d'Alene Basin RI/FS
RI REPORT

EPA REGION 10

Doc Control 4162500.6615.05a
Generation 1
n:\Projects\RI_FS\Spokane River|
Spokane River.apr
V:Spokane River Seg02 - Soil/Sediment
E:Spokane River Seg02
L: Final RI Spokane River Seg02 - Soil/Sediment
7/13/01

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: July 13, 2001

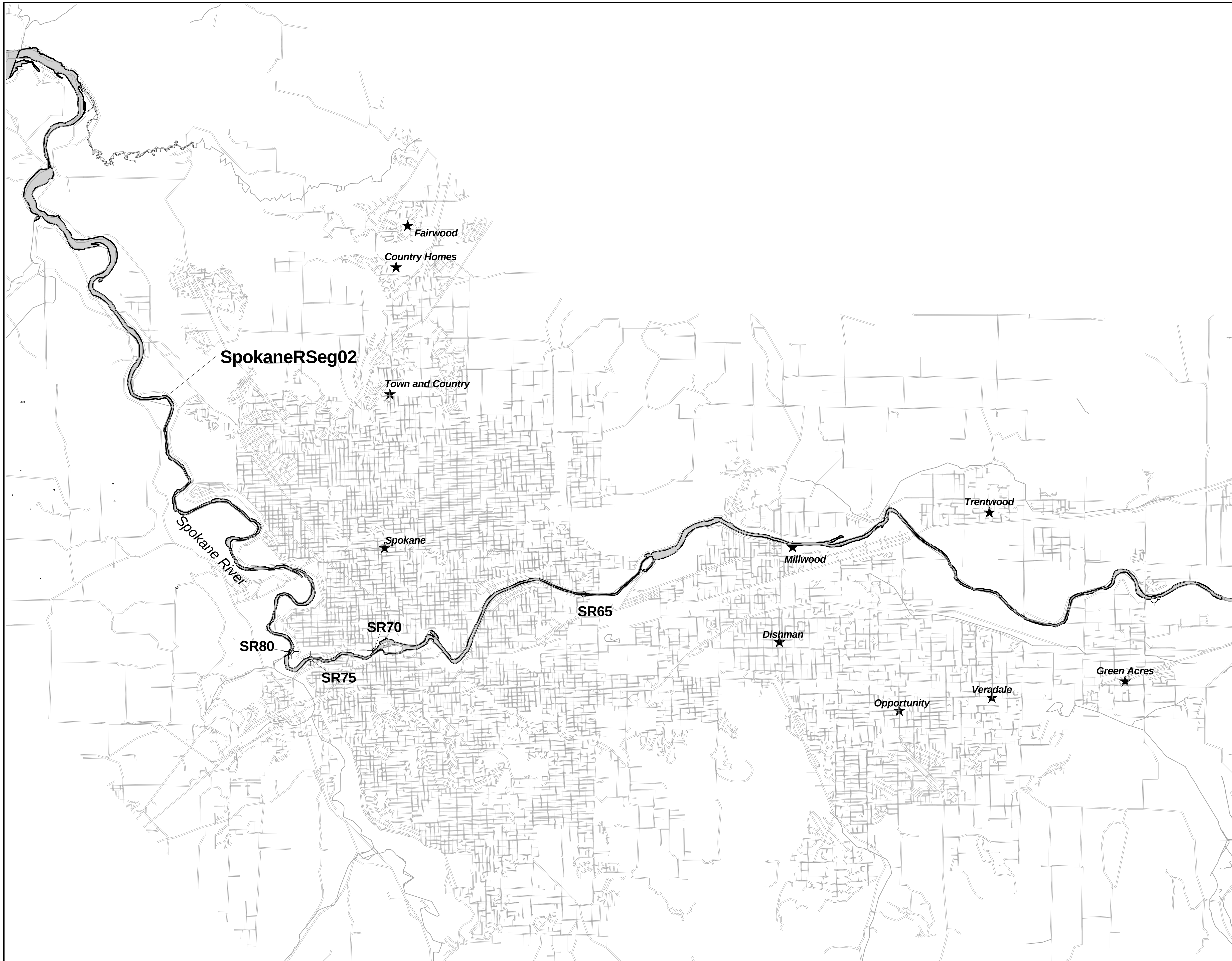


Figure 4.1-4
Spokane River Segment SpokaneRSeg02
Surface Water Sampling Locations

LEGEND

- River Sampling Location
- Stream
- Road
- Interstate 90
- City
- Spokane River Segment 2

Location Map

NOTES

1) Base map coverages obtained from the Coeur d'Alene Tribe, URS Greiner Inc., CH2M HILL, and the Bureau of Land Management.

2) Sampling Locations from URS Greiner Woodward Clyde Technical Data Management Database as of 03/29/00

N

SCALE 1:100,000

0 0.5 1 Miles

027-RI-CO-102Q
Coeur d'Alene Basin RI/FS
RI REPORT

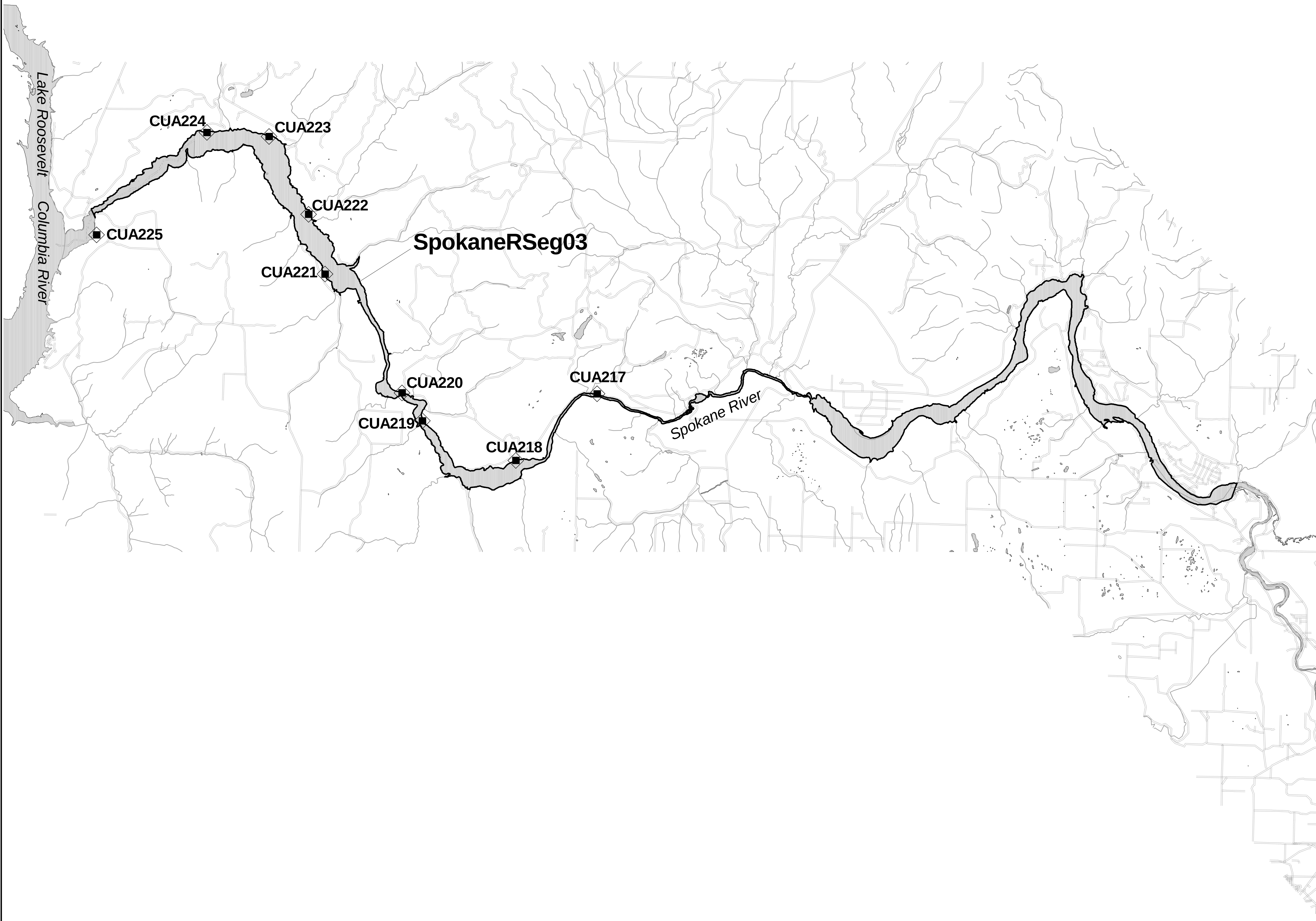
EPA REGION 10

Doc Control 4162500.6615.05a
Generation 1
n:\Projects\RI_FS\Spokane River|
Spokane River.apr
V:Spokane River Seg02 - Surface Water
E:Spokane River Seg02
L: Final RI Spokane River Seg02 - Surface Water
7/10/01

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: July 10, 2001

Figure 4.1-5
Spokane River Segment SpokaneRSeg03 Soil/Sediment Sampling Locations



LEGEND

- Common Use Area Sampling Location
- Hand Auger Sampling Location
- River Sampling Location
- Stream
- Road
- Interstate 90
- City
- Spokane River Segment 3

Location Map

NOTES

1) Base map coverages obtained from the Coeur d'Alene Tribe, URS Greiner Inc., CH2M HILL, and the Bureau of Land Management.

2) Sampling Locations from URS Greiner Woodward Clyde Technical Data Management Database as of 03/29/00

N

SCALE 1:200,000

0 0.5 1 Miles

027-RI-CO-102Q
Coeur d'Alene Basin RI/FS
RI REPORT

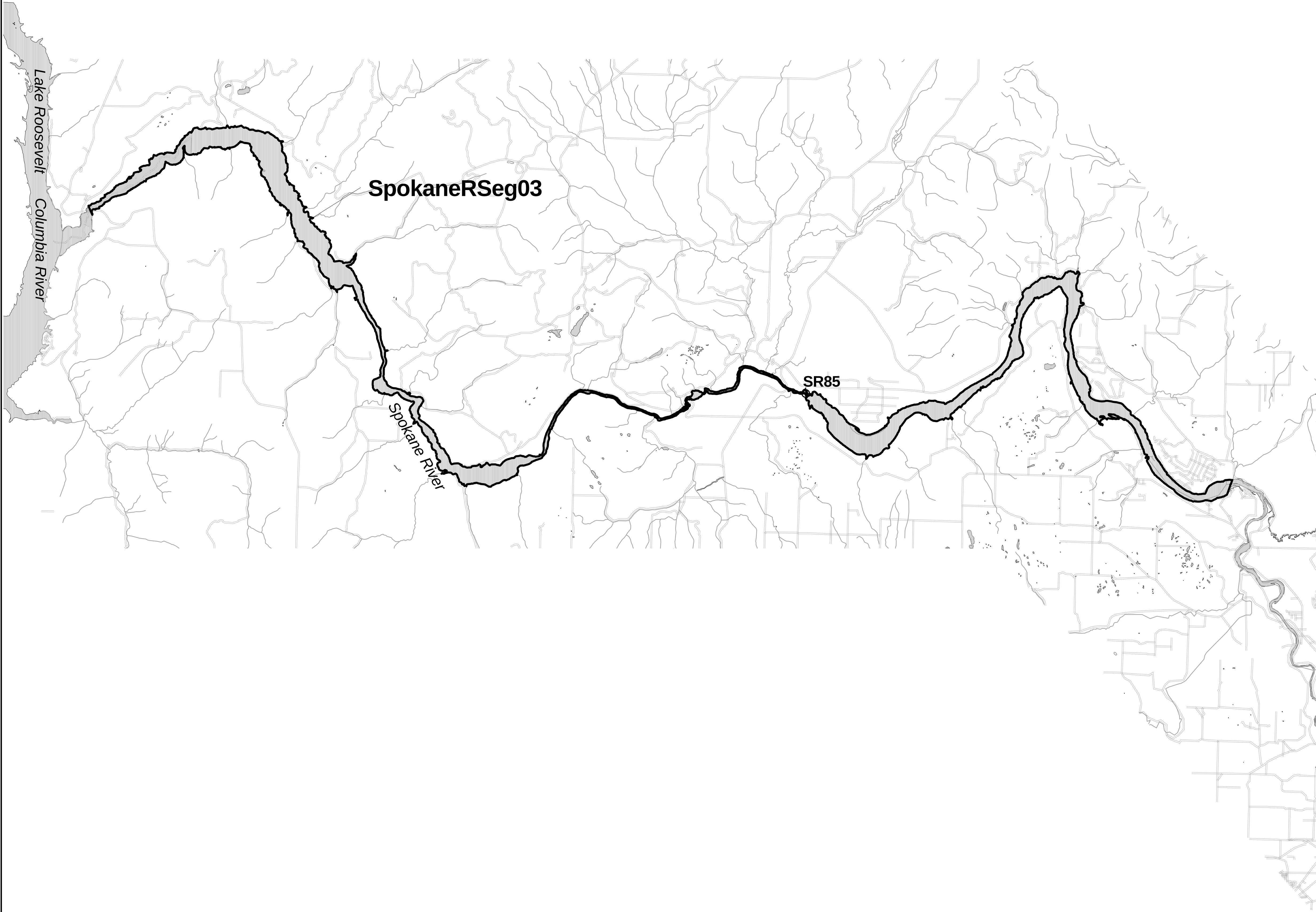
EPA REGION 10

Doc Control 4162500.6615.05a
Generation 1
n:\Projects\RI_FS\Spokane River|
Spokane River.apr
V:Spokane River Seg03 - Soil Sediment
E:Spokane River Seg03
L: Final RI Spokane River Seg03 - Soil/Sediment
7/10/01

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: July 10, 2001

Figure 4.1-6
Spokane River Segment SpokaneRSeg03
Surface Water Sampling Locations



LEGEND

- River Sampling Location
- Stream
- Road
- Interstate 90
- City
- Spokane River Segment 3

Location Map

NOTES

1) Base map coverages obtained from the Coeur d'Alene Tribe, URS Greiner Inc., CH2M HILL, and the Bureau of Land Management.

2) Sampling Locations from URS Greiner Woodward Clyde Technical Data Management Database as of 03/29/00

SCALE 1:200,000

0 0.5 1 Miles

027-RI-CO-102Q
Coeur d'Alene Basin RI/FS
RI REPORT

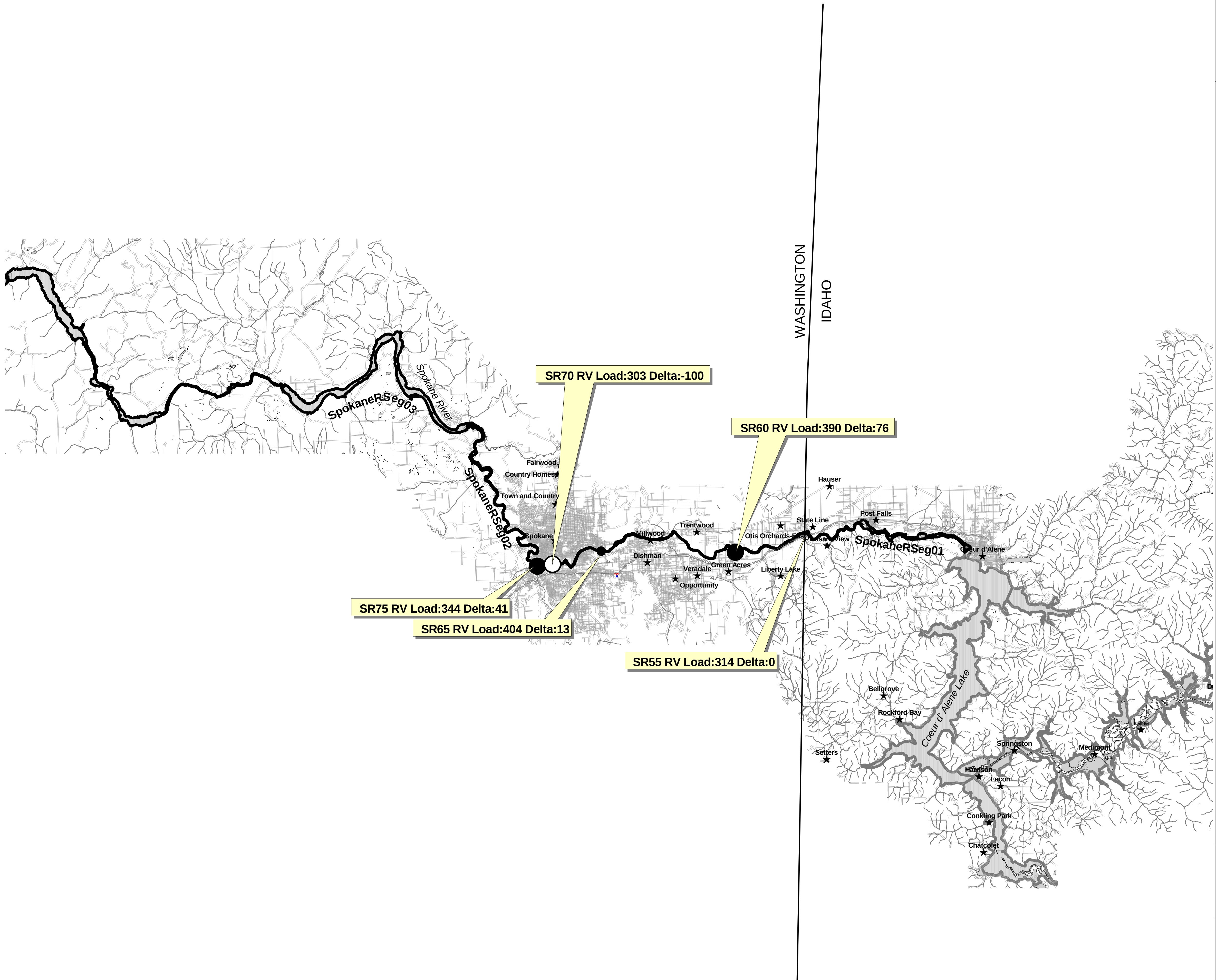
EPA REGION 10

Doc Control 4162500.6615.05a
Generation 1
n:\Projects\RI_FS\Spokane River|
Spokane River.apr
V:Spokane River Seg03 - Surface Water
E:Spokane River Seg03
L: Final RI Spokane River Seg03 - Surface Water
7/10/01

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: July 10, 2001

Figure 4.2-1
Spokane River Watershed
Total Lead Mass Loading
Sampling Results May 1999



Sampling Location

Values are lbs/day

SR60 RV Load:390 Delta:76

Location Type:

RV: River/Stream Sampling Location

(-) Neg.	(+) Pos.	Delta of Mass Load Compared to Preceeding Upstream Sampling Location
		Delta Range: 0 - 0.9
		Delta Range: 1 - 20
		Delta Range: 20 - 40
		Delta Range: 40 - 100
		Delta Range: 100 - 150
		Delta Range: > 150

Stream

Interstate 90

City

River/Lake

Spokane River Watershed

Spokane River Segment

River Segment

Idaho

Washington

Location Map

NOTES

1) Base map coverages obtained from the Coeur d' Alene Tribe, URS Greiner Inc., CH2M HILL, and the Burueau of Land Management.

Scale: 1: 350,000

0 5 Miles

N

027-RI-C0-102Q
Coeur d' Alene Basin RI/FS
RI Report

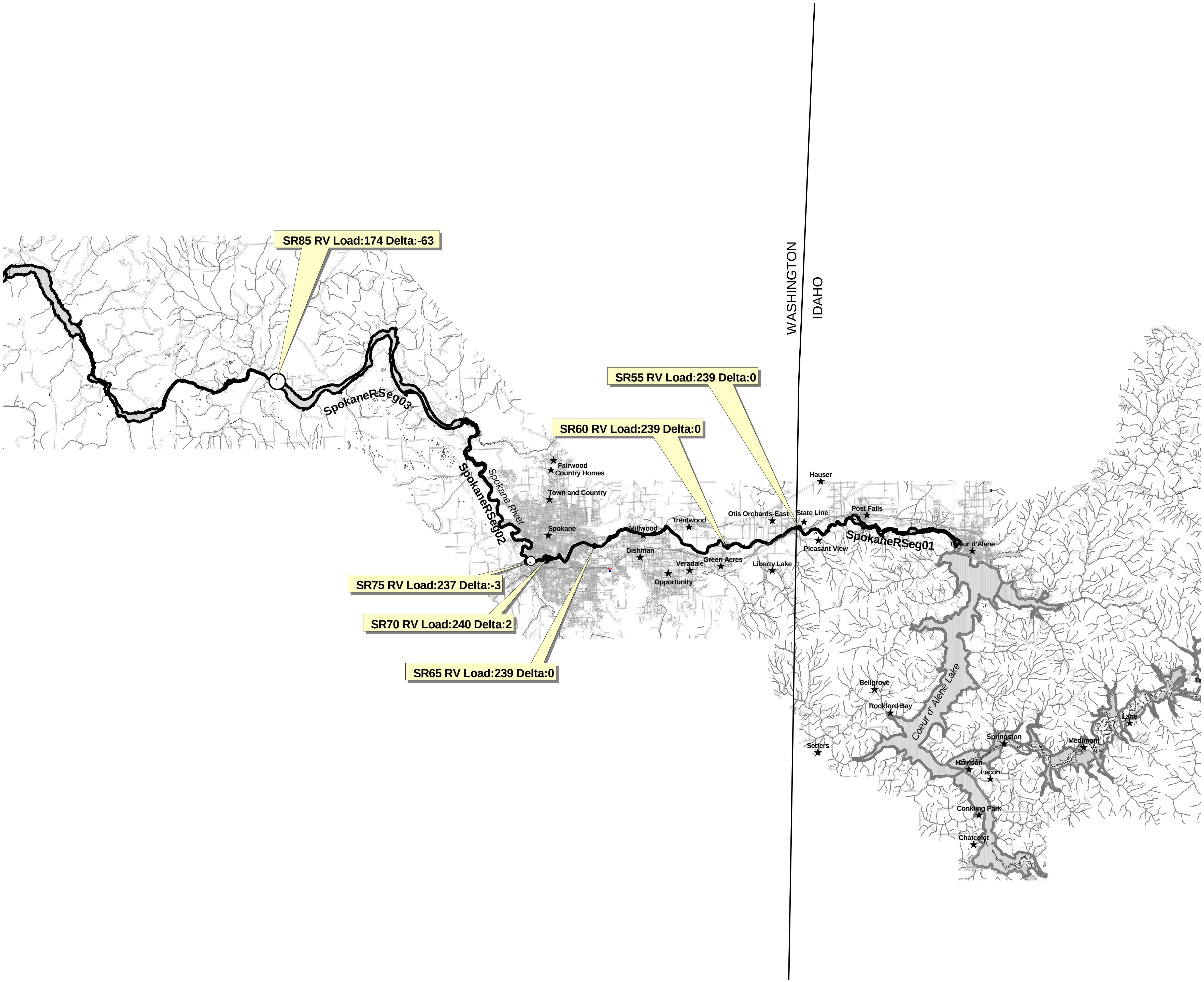
EPA REGION 10

Document Control 4162500.6615.05.a
Generation 1
n:\Projects\watersheds\spokaneriver
massload_spokane_river8-2.apr
V: SR-may99-lead
L: Final RI SR-may99-lead
7/11/01

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: July 10, 2001

Figure 4.2-2
Spokane River Watershed
Total Lead Mass Loading
Sampling Results June 1999



Sampling Location

Values are lbs/day

SR85 RV Load:174 Delta:-63

Location Type:

RV: River/Stream Sampling Location

(-) Neg.	(+) Pos.	Delta of Mass Load Compared to Preceeding Upstream Sampling Location
		Delta Range: 0 - 0.9
		Delta Range: 1 - 20
		Delta Range: 20 - 40
		Delta Range: 40 - 100
		Delta Range: 100 - 150
		Delta Range: > 150

Stream

Interstate 90

City

River/Lake

Spokane River Watershed

Spokane River Segment

River Segment

Location Map

NOTES

1) Base map coverages obtained from the Coeur d' Alene Tribe, URS Greiner Inc., CH2M HILL, and the Buruueau of Land Management.

Scale: 1: 350,000

0 5 Miles

N

027-RI-C0-102Q
Coeur d' Alene Basin RI/FS
RI Report

EPA
REGION 10

Document Control 4162500.6615.05.a
Generation 1
n:\Projects\watersheds\Spokane_river
massload_spokane_river8-2.apr
V: SR-june99-lead
L: Final RI SR-june99-lead
7/10/01

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: July 10, 2001

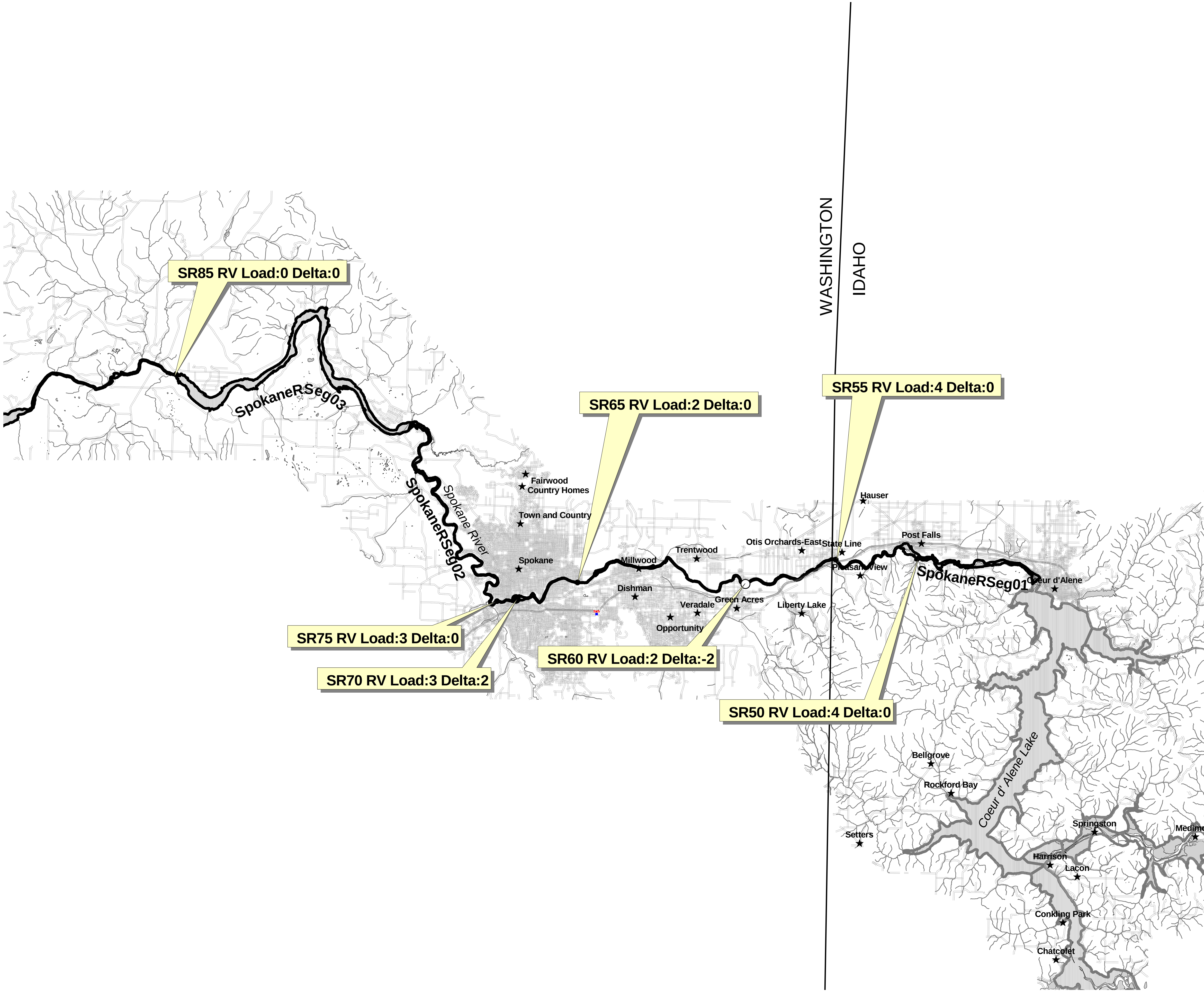


Figure 4.2-3
Spokane River Watershed Total Lead Mass Loading Sampling Results Sept. 1999

LEGEND

Sampling Location

Values are lbs/day

SR85 RV Load:0 Delta:0

Location Type:

RV: River/Stream Sampling Location

(-) Neg.	(+) Pos.	Delta of Mass Load Compared to Preceeding Upstream Sampling Location
		Delta Range: 0 - 0.9
		Delta Range: 1 - 20
		Delta Range: 20 - 40
		Delta Range: 40 - 100
		Delta Range: 100 - 150
		Delta Range: > 150

- Stream
- Interstate 90
- City
- River/Lake
- Spokane River Watershed
- Spokane River Segment
- River Segment

Location Map

NOTES

1) Base map coverages obtained from the Coeur d' Alene Tribe, URS Greiner Inc., CH2M HILL, and the Burueau of Land Management.

Scale: 1: 350,000

0 5 Miles

N

027-RI-C0-102Q
Coeur d' Alene Basin RI/FS
RI Report

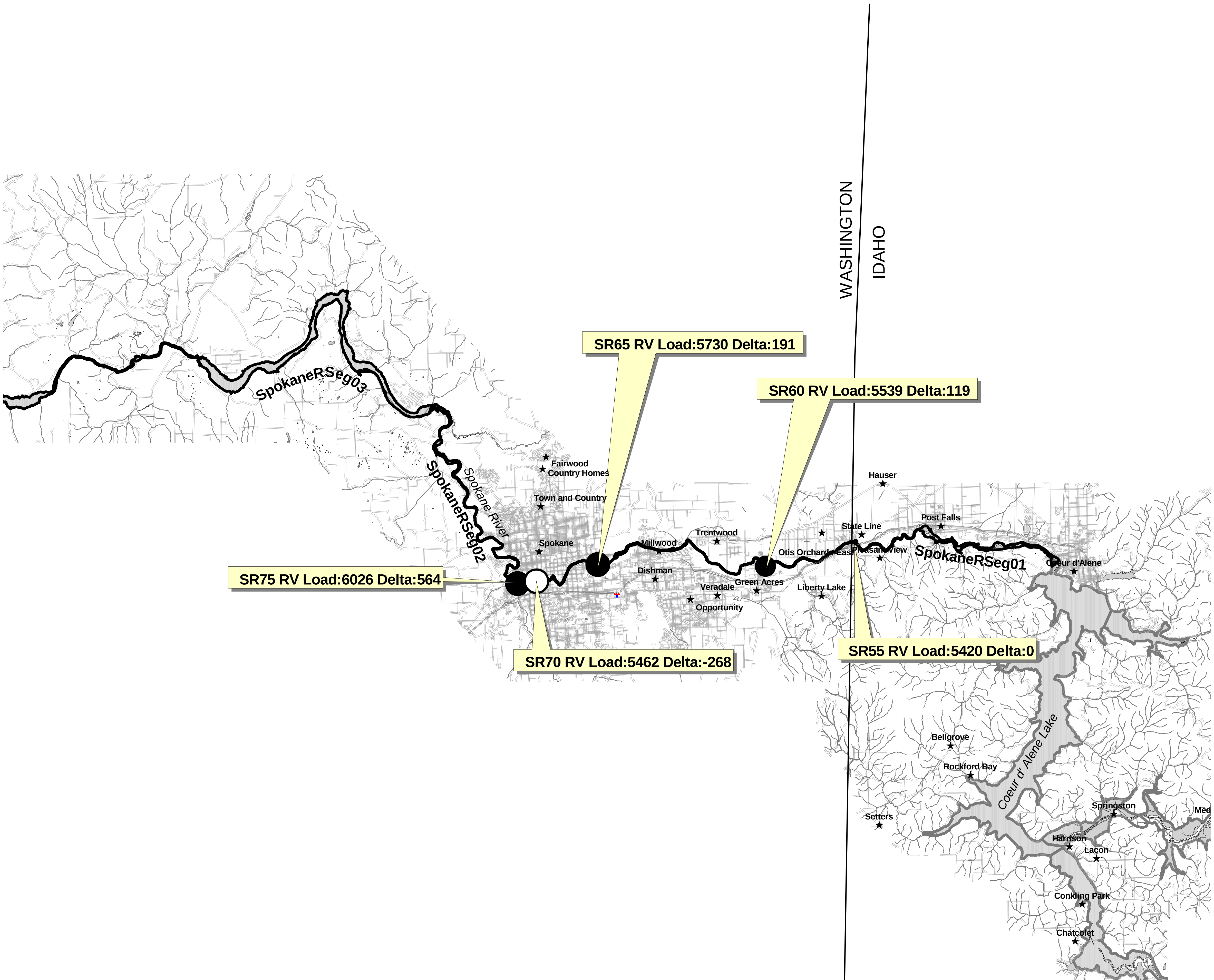
EPA REGION 10

Document Control 4162500.6615.05a
Generation 1
n:\Projects\watersheds\Spokane_river\massload_spokane_river8-2.apr
V: SR-sep99-lead
L: Final RI SR-sep99-lead
7/10/2001

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: July 10, 2001

Figure 4.2-4
Spokane River Watershed
Dissolved Zinc Mass Loading
Sampling Results May 1999



Sampling Location

Values are lbs/day

SR65 RV Load:5730 Delta:191

Location Type:

RV: River/Stream Sampling Location

(-) Neg.	(+) Pos.	Delta of Mass Load Compared to Preceeding Upstream Sampling Location
		Delta Range: 0 - 0.9
		Delta Range: 1 - 20
		Delta Range: 20 - 40
		Delta Range: 40 - 100
		Delta Range: 100 - 150
		Delta Range: > 150

Stream

Interstate 90

City

River/Lake

Spokane River Watershed

Spokane River Segment

River Segment

Idaho

Washington

Location Map

NOTES

1) Base map coverages obtained from the Coeur d' Alene Tribe, URS Greiner Inc., CH2M HILL, and the Buruea of Land Management.

Scale: 1: 350,000

0 5 Miles

N

027-RI-C0-102Q
Coeur d' Alene Basin RI/FS
RI Report

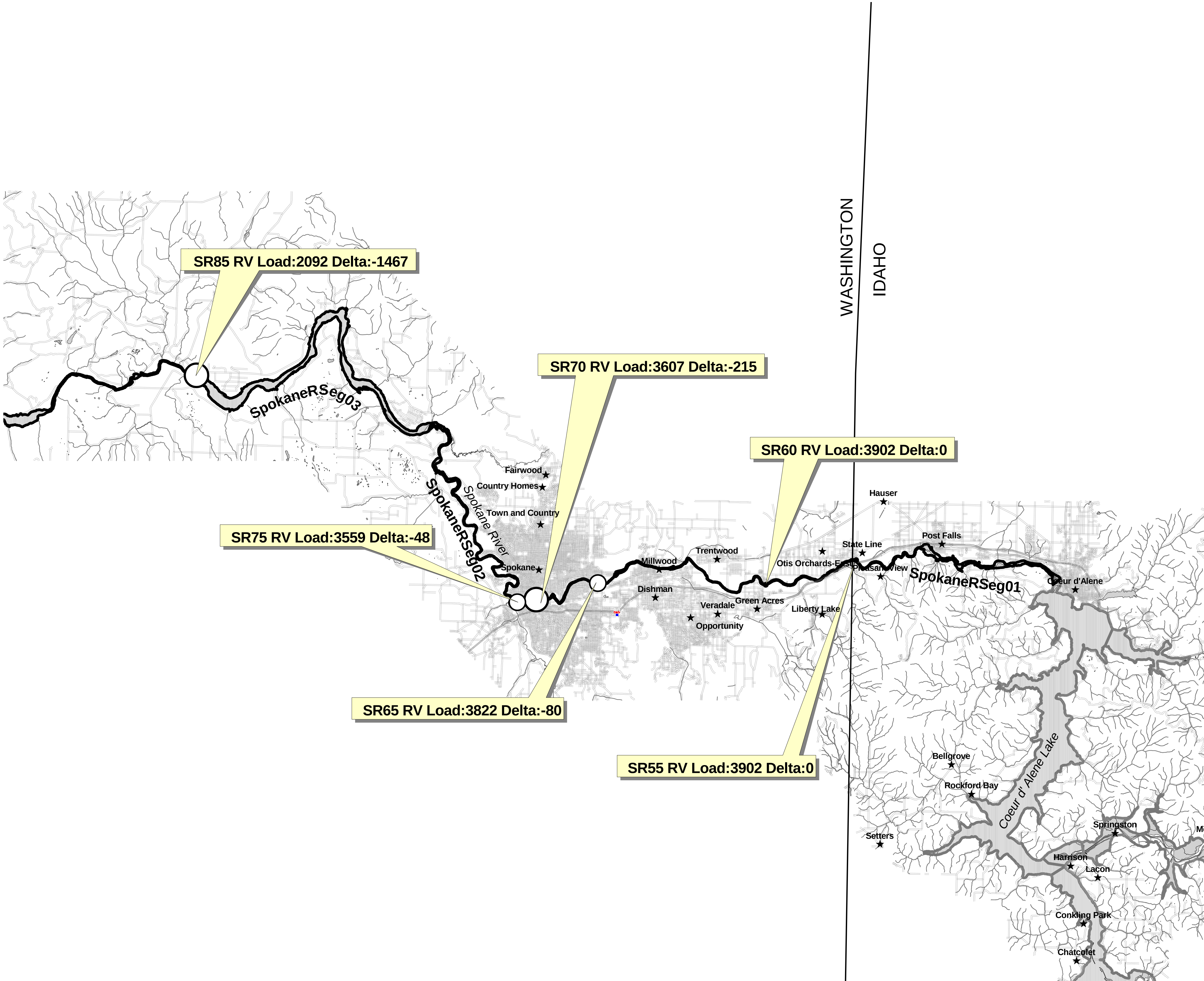
EPA REGION 10

Document Control 4162500.6615.05.a
Generation 1
n:\Projects\watersheds\Spokane_river\massload_spokane_river8-2.apr
V: SR-may99-zinc
L: Final RI SR-may99-zinc
7/10/2001

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: July 10, 2001

Figure 4.2-5
Spokane River Watershed
Dissolved Zinc Mass Loading
Sampling Results June 1999



Sampling Location

Values are lbs/day

SR85 RV Load:2092 Delta:-1467

Location Type:

RV: River/Stream Sampling Location

(-) Neg.	(+) Pos.	Delta of Mass Load Compared to Preceeding Upstream Sampling Location
		Delta Range: 0 - 0.9
		Delta Range: 1 - 20
		Delta Range: 20 - 40
		Delta Range: 40 - 100
		Delta Range: 100 - 150
		Delta Range: > 150

Stream

Interstate 90

City

River/Lake

Spokane River Watershed

Spokane River Segment

River Segment

Location Map

NOTES

1) Base map coverages obtained from the Coeur d' Alene Tribe, URS Greiner Inc., CH2M HILL, and the Burueau of Land Management.

Scale: 1: 350,000

0 5 Miles

N

027-RI-C0-102Q
Coeur d' Alene Basin RI/FS
RI Report

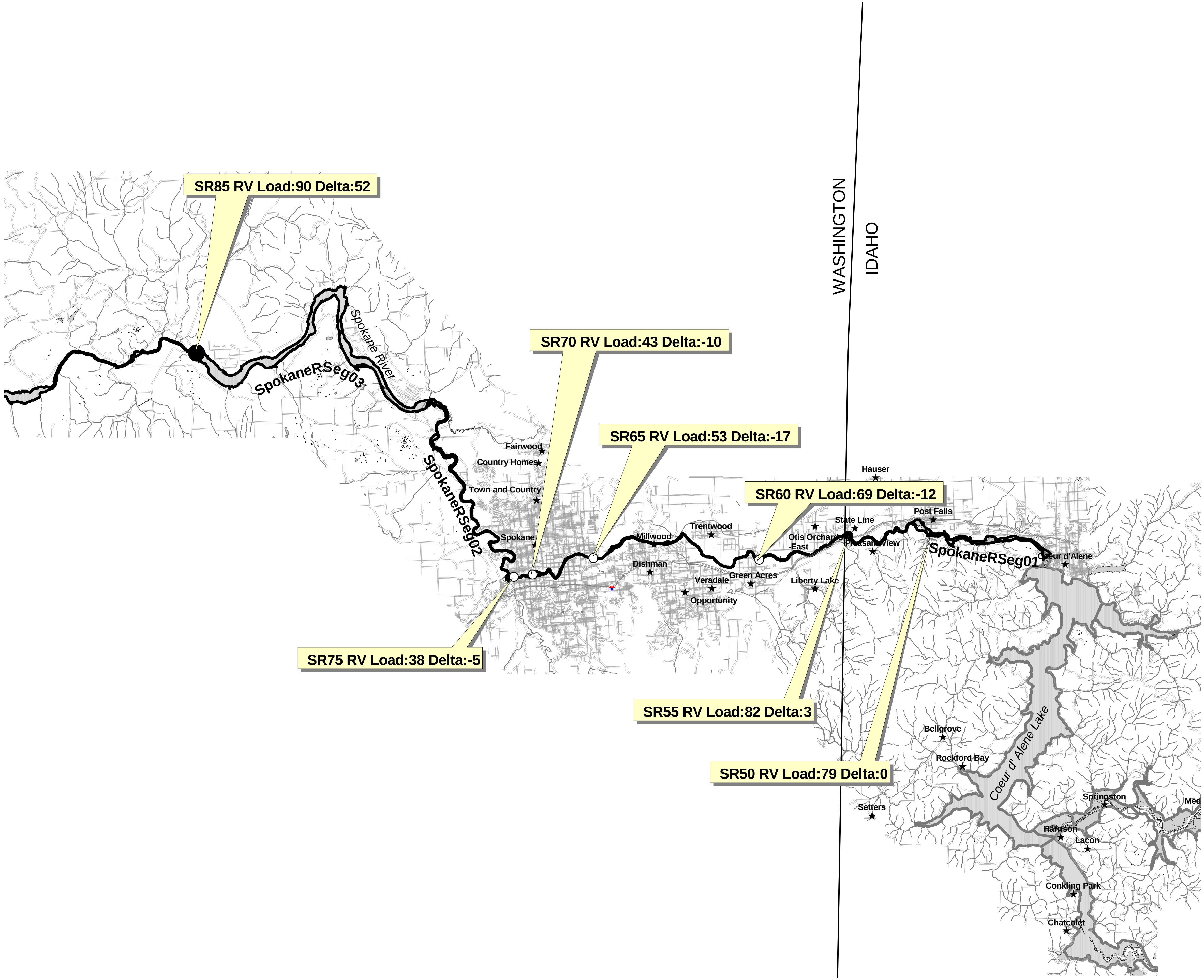
EPA REGION 10

Document Control 4162500.6615.05.a
Generation 1
n:\Projects\watersheds\Spokane_river\massload_spokane_river8-2.apr
V: SR-june99-zinc
L: Final RI SR-june99-zinc
7/10/2001

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: July 10, 2001

Figure 4.2-6
Spokane River Watershed
Dissolved Zinc Mass Loading
Sampling Results Sept. 1999



Sampling Location

Values are lbs/day

SR85 RV Load:90 Delta:52

Location Type:

RV: River/Stream Sampling Location

(-) Neg.	(+) Pos.	Delta of Mass Load Compared to Preceeding Upstream Sampling Location
		Delta Range: 0 - 0.9
		Delta Range: 1 - 20
		Delta Range: 20 - 40
		Delta Range: 40 - 100
		Delta Range: 100 - 150
		Delta Range: > 150

Stream

Interstate 90

City

River/Lake

Spokane River Watershed

Spokane River Segment

River Segment

Idaho

Washington

Location Map

NOTES

1) Base map coverages obtained from the Coeur d' Alene Tribe, URS Greiner Inc., CH2M HILL, and the Burueau of Land Management.

Scale: 1: 350,000

0 5 Miles

N

027-RI-C0-102Q
Coeur d' Alene Basin RI/FS
RI Report

EPA REGION 10

Document Control 4162500.6615.05.a
Generation 1
n:\Projects\watersheds\Spokane_river
massload_spokane_river8-2.apr
V: SR-sep99-zinc
L: Final RI SR-sep99-zinc
7/10/01

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: July 10, 2001

Table 4.2-1
Mass Loading Spokane River

Location	Sample Type	Sample No.	Sample Date	Flow (CFS)	Total Lead Conc. (µg/L)	Total Lead Load (lbs/day)	Total Lead Delta[a] (lbs/day)	Dissolved Zinc Conc. (µg/L)	Dissolved Zinc Load (lbs/day)	Dissolved Zinc Delta[a] (lbs/day)
SR50	RV	187071	12-Apr-99	10,100	3	163	-	88	4782	-
SR55	RV	187076	15-Apr-99	9,100	3	147	-16	90	4406	-376
SR60	RV	187080	15-Apr-99	10,000	3	161	15	86	4627	221
SR65	RV	187084	15-Apr-99	10,000	3	161	0	92	4950	323
SR70	RV	187088	16-Apr-99	10,200	3	165	3	83	4555	-395
SR75	RV	187097	13-Apr-99	10,000	2	108	-57	84	4519	-36
SR85	RV	187111	13-Apr-99	11,400	2	123	-15	56	3435	-1,085
SR55	RV	187077	13-May-99	14,600	4	314	-	69	5420	-
SR60	RV	187081	13-May-99	14,500	5	390	76	71	5539	119
SR65	RV	187085	13-May-99	15,000	5	404	13	71	5730	191
SR70	RV	187089	14-May-99	14,100	4	303	-100	72	5462	-268
SR75	RV	187098	11-May-99	16,000	4	344	41	70	6026	564
SR55	RV	187078	17-Jun-99	14,800	3	239	-	49	3902	-
SR60	RV	187082	17-Jun-99	14,800	3	239	0	49	3902	0
SR65	RV	187086	17-Jun-99	14,800	3	239	0	48	3822	-80
SR70	RV	187090	18-Jun-99	14,900	3	240	2	45	3607	-215
SR75	RV	187100	15-Jun-99	14,700	3	237	-3	45	3559	-48
SR85	RV	187114	15-Jun-99	16,200	2	174	-63	24	2092	-1,467
SR50	RV	202126	09-Aug-99	2,180	1.2	14	-	37	434	-
SR55	RV	202123	11-Aug-99	1,740	1.2	11	-3	33	309	-125
SR60	RV	202120	11-Aug-99	1,820	1	10	-1	37	362	53
SR65	RV	202117	09-Aug-99	1,900	1.1	11	1	26	266	-97
SR70	RV	202114	09-Aug-99	2,650	0.81	12	0	20	285	19
SR75	RV	202111	09-Aug-99	2,320	1.4	17	6	20	250	-36
SR85	RV	202105	10-Aug-99	5,010	-	-	-	9	243	-7
SR50	RV	202127	07-Sep-99	458	1.7	4	-	32	79	-
SR55	RV	202124	09-Sep-99	633	1.1	4	0	24	82	3
SR60	RV	202121	09-Sep-99	444	0.84	2	-2	29	69	-12
SR65	RV	202118	09-Sep-99	444	0.67	2	0	22	53	-17
SR70	RV	202115	09-Sep-99	1,130	0.51	3	2	7	43	-10
SR75	RV	202112	08-Sep-99	1,000	0.55	3	0	7	38	-5
SR85	RV	202106	08-Sep-99	3,350	-	-	-	5	90	52

[a]The Delta value reported at a sample location is the difference between mass load at that location and the next upstream sample location.

Notes:
cfs - cubic feet per second
µg/L - micrograms per liter
lbs/day - pound per day
RV - River sample

5.0 FATE AND TRANSPORT

The fate and transport of metals in surface water, groundwater, and sediment in the Spokane River Watershed are discussed in this section. A conceptual model of fate and transport, important fate and transport mechanisms, and a summary of the probabilistic model developed to evaluate fate and transport, were presented in the fate and transport section in the Canyon Creek report and are not repeated here. This section draws upon that general information.

Initial findings on metals concentrations and mass loading for each segment, as presented above in Section 4, Nature and Extent, are briefly summarized in Section 5.1. Results of the probabilistic modeling are presented in Section 5.2. Sediment transport is summarized in Section 5.3. A summary of fate and transport of metals in the Spokane River is presented in Section 5.4.

5.1 INTRODUCTION

Metals discharged from Coeur d'Alene Lake in dissolved and particulate form are carried down the Spokane River. The Spokane River regularly exceeds water quality standards for zinc. Standards for lead and cadmium are also frequently exceeded, especially at higher flows (Ecology 1998).

Fine-grained sediment in the Spokane River is contaminated with lead and zinc. Metal concentrations in the Spokane River generally decrease from upstream to downstream. Sediment screening levels are exceeded in several locations where fine-grained sediment accumulates, most notably along shoreline beaches behind small dams in segment SpokaneRSeg02.

5.2 MODEL RESULTS

Results from the probabilistic model are discussed for cadmium, lead, and zinc in this section. Modeling results for estimates of discharge are discussed in Section 5.2.1. Modeling results for estimates of chemical concentrations and mass loading of cadmium, lead, and zinc are discussed in Section 5.2.2. Model results are summarized in Table 5.2-1. All modeling results are included in Appendix C.

Data were evaluated for seven separate sampling locations. Only sampling locations with seven or more individual data points for each parameter of interest were evaluated. Typically, the criterion used for selecting sampling locations was, minimally, 10 or more sampling events at a given location. However, because only one sampling location in the Spokane River met this criterion for all parameters of interest, the criterion was lowered to seven or more sampling events at a given location. Fewer sampling locations are addressed through quantification of greater uncertainty (e.g., greater variability) in the estimations.

The sampling locations that met the above criterion are shown on Figure 5.2-1. In the Spokane River, the seven sampling locations, in order from upstream to downstream are SR50, SR55, SR60, SR65, SR70, SR75, and SR85. The first, and most upgradient sampling location evaluated, SR50, is located at the Post Falls dam near the town of Post Falls, Idaho. The next sampling location, SR55, is located at the State line between Idaho and Washington. Sampling location SR60 is situated between the State Line and the western boundary of the City of Spokane. Proceeding further downstream, the next sampling location, SR65, is situated on the eastern edge of the City of Spokane. The next two sampling locations (SR70 and SR75) are approximately in the middle and western portion, respectively, of the City of Spokane. The last sampling location evaluated on the Spokane River, SR85, is located at the western outlet from Long Lake.

Sampling locations SR50 and SR55 lie within segment SpokaneRSeg01. Locations SR60, SR65, SR70, and SR75 lie within segment SpokaneRSeg02. The last down-river sampling location, SR85, is in segment SpokaneRSeg03. For purposes of this report, the discussion will proceed on a reach-by-reach basis within the various segments. River stretches bracketed by sampling locations are designated reaches. For example, the portion of the Spokane River lying between sampling locations SR50 and SR55 is called a reach. Accordingly, there are six reaches encompassed by the seven sampling locations.

5.2.1 Estimated Discharge

An example of the lognormal distribution of discharge data at sampling location SR50 at Post Falls Dam is shown in Figure 5.2-2. Data from sampling location SR50 are used throughout this discussion for consistency of presentation and, additionally, because it is the station evaluated that is nearest the beginning of the Spokane River. Moreover, significant numbers of sampling and analyses events took place at this location.

In Figure 5.2-2, the discharge in cfs is plotted on a log scale versus the normal standard variate. The normal standard variate is equivalent to the standard deviation for a normalized variable.

When the log of a variable (e.g., discharge) is plotted versus the standard normal variate, a straight line will result if the data are lognormally distributed. The cumulative distribution function gives the probability that the observed discharge at any given time will not be exceeded by the estimated discharge at that cumulative probability. The cumulative distribution function is plotted versus the normal standard variate in Figure 5.2-3. To determine the probability of occurrence of a specific discharge, first select the discharge of interest on Figure 5.2-2, then find its corresponding normal standard variate. Using that value for the normal standard variate, look up its corresponding cumulative probability in Figure 5.2-3. For example, for a discharge of 1,000 cfs, the normal standard variate is approximately -1.0 (Figure 5.2-2). Looking on Figure 5.2-3, this value corresponds to a cumulative probability of approximately 0.16; therefore, approximately 16 percent of the time, discharges at this location will be 1,000 cfs or less.

As shown in Figure 5.2-2, there is a good fit of the lognormal regression line (solid line in Figure 5.2-2) to the data. This goodness of fit, as evidenced by a high coefficient of determination ($r^2 = 0.99$), supports the assumption that discharges are lognormally distributed. The dotted line represents the true (ideal) lognormal distribution having the same mean (6,860) and coefficient of variation (1.04) as the actual data. The estimated expected value of the discharge (7,530 cfs) is also shown on the plot of the discharge data.

The probability distribution function (PDF) shown in Figure 5.2-2 is a predictive tool that can be used to estimate the expected discharge and provide a quantitative estimate of the probability that the observed discharge will not exceed a given value. Conversely, one can find the estimated discharge rate having a specified probability of exceedance or non-exceedance by the observed discharge.

Table 5.2-2 contains data on the expected or estimated gains or losses (EV) in discharge and the coefficients of variation (CV) for reaches between sampling locations on the Spokane River. In Table 5.2-2, the reaches are placed in order from the dam at Post Falls (SR50) to the last sampling location (SR85) at the outlet from Long Lake. The expected value can be considered a "best estimate" of the true, but uncertain, value. Mathematically, the expected value is an average or mean value. For comparison, USGS (2000) mean daily discharge data from water year 1999 are included in Table 5.2-2.

The two losing reaches identified from the modeling were between sampling locations SR65 and SR70 where an estimated expected loss of 3,180 cfs occurred, and between sampling locations SR70 and SR75, where an estimated expected loss of 4,160 cfs occurred. Caution must be exercised in interpreting these results because of the paucity of data and possible discharge modifications resulting from opening and closing dams to stream flow. For example, the reach between SR50 and SR60 was studied by the Washington Department of Ecology (Ecology) and for the EPA (Gearhart and Buchanan 2000) in 1999. This reach can be either gaining or losing depending on flow conditions. The Ecology and the EPA reports are summarized in Section 2.2.3 above.

5.2.2 Estimated Cadmium, Lead, and Zinc Concentrations and Mass Loading

Dissolved zinc and total lead concentrations and loads were evaluated using the probabilistic model at the seven sampling locations (six reaches) that contained a minimum of seven data points. No probabilistic analysis of cadmium was undertaken because cadmium concentrations were generally less than the reporting limit of 0.5 µg/L.

5.2.2.1 Individual Sampling Locations

Figures 5.2-4 through 5.2-7 are provided to illustrate the lognormal distribution of dissolved zinc and total lead concentrations and dissolved zinc and total lead mass loading at sampling location SR50 on the Spokane River. The high r-squared values (r^2) for the dissolved concentrations and total loads when plotted lognormally attest to the fact that the data follow a lognormal distribution. For dissolved zinc concentrations, the r-squared value was 0.96. The r-squared value for the total lead concentration was 0.81. The corresponding values for dissolved zinc and total lead loads were 0.96 and 0.94, respectively. To assist in interpreting and placing the results in context, screening levels and expected values (EV) are shown on the figures where appropriate.

All measured and plotted total lead concentrations were less than the screening level (15 µg/L) for total lead concentrations in surface water (Figure 5.2-4). The estimated expected lead concentration (approximately 2 µg/L) also was less than the screening level.

All dissolved zinc concentrations plotted on Figure 5.2-5 (sampling location SR50) are greater than the screening level (30 µg/L) for dissolved zinc in surface waters. The estimated expected dissolved zinc concentration (approximately 58 µg/L) was approximately twice the screening level.

The estimated total lead load at SR50 is approximately 156 pounds/day (Figure 5.2-6). The estimated expected value exceeds the 90th percentile total maximum daily load (TMDL) (20.0 pounds/day) established at Harrison by several fold. Some of the measured lead loads at SR50 are greater than 10 times the 90th percentile TMDL for Harrison on the Coeur d'Alene River.

TMDLs have been established for the Spokane River by the Washington State Department of Ecology (Ecology 1998). TMDLs are the National Ambient Water Quality Criteria (in micrograms per liter) adjusted for site-specific hardness. TMDLs have not been established on a pounds per day basis as done for the Coeur d'Alene River; therefore, the TMDLs established for the Coeur d'Alene River at Harrison are used in this evaluation of mass loading for comparison purposes only.

The TMDLs used were those presented in the Technical Support Document of August 2000 (USEPA 2000). Strictly speaking, TMDLs for non-point sources are for dissolved loads. The TMDL for dissolved lead was compared to the estimated value for total lead to provide a reference value and point of discussion for total lead because of its importance. Often, most of the lead will be in the particulate, as opposed to dissolved, form. Because a high percentage of zinc loads are in the dissolved form, dissolved zinc loads were compared to their respective dissolved TMDL loading capacities.

The estimated dissolved zinc load is approximately three times the 90th percentile TMDL (1,200 pounds/day) established at Harrison (Figure 5.2-7).

Figures similar to Figures 5.2-4 to 5.2-7 were developed for each of the seven sampling locations. The results of these and additional analyses are presented in Appendix C. Data in Appendix C were used to compute gains or losses in expected values and the coefficients of variation for dissolved and total zinc and lead concentrations and loads in the six reaches of the Spokane River. Measured cadmium concentrations were generally less than reporting limits and, therefore, are not presented in these tables. The resulting computations are presented in Tables 5.2-3 to 5.2-6. The calculations were performed in the same manner as described in the discharge section (Section 5.2.1).

There was a general trend of decreasing zinc concentrations with increasing downstream distance along the Spokane River. The largest decrease in zinc concentrations occurred between Spokane (SR75) and the outlet from Long Lake (SR85).

There was no statistically significant increase or decrease in the estimated lead concentrations. The largest decrease in the estimated total lead concentrations and loads occurred between the City of Spokane (SR75) and the outlet from Long Lake (SR85).

5.2.2.2 Segment SpokaneRSeg01

This segment has two sampling locations that were evaluated, SR50 at the Post Falls Dam and SR55 at the Idaho/Washington State line. The reach from the Post Falls Dam to the State line is free flowing. Metal concentrations and flows measured at Post Falls Dam by the USGS are the basis for estimating discharges of metals from Coeur d'Alene Lake. The estimated expected values for total lead and dissolved zinc mass loading at sampling location SR50 are 156 and 3,640 pounds/day, respectively. For comparison, the estimated expected values for total lead and dissolved zinc mass loading at sampling location LC60, located on the lower Coeur d'Alene River above Harrison, are 1,510 and 4,190 pounds/day, respectively. Comparing modeling results for these two locations illustrates the decrease of metals concentrations exiting Coeur d'Alene River via Coeur d'Alene Lake before discharging to the Spokane River. As presented in the CSM Unit 4 report on Coeur d'Alene Lake (separate cover), lake processes, including aggregation, complexation, and adsorption, resulted in sedimentation (or loss) to the lakebed of total and dissolved metals delivered to the lake from the Coeur d'Alene River. All measured total lead concentrations for sampling location SR50 were less than the screening level (15 µg/L). All measured dissolved zinc concentrations for sampling location SR50 were greater than the screening level (30 µg/L).

Downgradient from the lake, in the reach between SR50 and SR55, cadmium concentrations are low with the majority of the measured values less than reporting limits (0.5 µg/L).

Estimated values of dissolved zinc concentrations decreased in this reach, while the dissolved zinc load increased. The increased dissolved zinc load resulted from an estimated increased discharge of approximately 2,480 cfs in this reach.

At the downstream sampling location in this reach (SR55), the estimated value of dissolved zinc exceeded the screening level. The total lead concentration increased slightly. The estimated total lead load increased by approximately 91 pounds/day, affected by the estimated increased discharge.

Probabilistic modeling at SR55 indicated that essentially all of the zinc concentration and approximately 40 percent of the lead concentration was in the dissolved phase. Based on evaluation of data at SR55, estimated values of the loadings of dissolved zinc and total lead between the Post Falls Dam and the State line are, approximately, a gain of 1,360 pounds zinc/day and a gain of 91 pounds lead/day. As mentioned previously, there are no primary sources between the Post Falls Dam and the State line.

5.2.2.3 Segment SpokaneRSeg02

This segment extends from the State line to Long Lake and contains both free-flowing stretches and backwaters behind dams. Deposition of fine-grained sediments occurs in the backwater areas. Exchanges of groundwater and surface water occur throughout this reach. Dissolved zinc concentrations exceed ambient water quality criteria throughout most of the year and water quality criteria for total lead are exceeded during high flows.

Fine-grained sediments in depositional areas have elevated concentrations of lead. Deposition takes place primarily behind Upriver Dam, behind the low dam at Spokane Falls in Spokane, and behind Ninemile Dam downstream from Spokane. Pockets of fine-grained sediments are located behind boulders and on small beaches throughout the segment. Backwater areas behind dams contain small areas of riparian habitat that would not normally exist along the Spokane River. Hangman Creek enters the Spokane River just west of downtown Spokane and, during high flows, contributes substantial quantities of clean sediments to the Spokane River.

Four sampling locations, SR60, SR65, SR70, and SR75, lie within this reach. Estimated (average) values of dissolved zinc concentrations remained more or less constant between the State line (SR55) and the last sampling location (SR75) evaluated within this reach. The total lead concentrations also remained relatively constant in this reach. The estimated value of dissolved zinc concentration remained above the screening criteria for surface waters. Estimated value of total lead concentration was below the screening level.

Probabilistic modeling at SR75 indicated that essentially all of the zinc concentration and approximately 35 percent of the lead concentration would be in the dissolved phase. Based on evaluation of data at SR55 and SR75, estimated values of the loadings for dissolved zinc and total lead between the State line and the western portion of the City of Spokane are, approximately, a loss of 690 pounds zinc/day and a gain of 38 pounds lead/day.

5.2.2.4 Segment SpokaneRSeg03

This segment consists primarily of Long Lake (a reservoir on the Spokane River) and the Spokane Arm of Lake Roosevelt. The Little Spokane River enters the Spokane River near the upper boundary of this segment. Concentrations of dissolved metals in the surface water of this segment generally do not exceed ambient water quality criteria. Concentrations of metals in the sediment of Long Lake are slightly elevated.

This segment has one sampling location that was evaluated, SR85, at the outlet from Long Lake. Cadmium concentrations remained low throughout this reach with the majority of measured values less than reporting limits of 0.5 µg/L.

At SR85, estimated values of concentrations of dissolved zinc and total lead were less than screening levels.

Probabilistic modeling at SR55 indicated that essentially all of the zinc concentration and approximately 70 percent of the lead concentration was in the dissolved phase. Based on evaluation of data at SR85, estimated values of the loadings of dissolved zinc and total lead between the western portion of the City of Spokane and the outlet from Long Lake are, approximately, a loss of 2,100 pounds zinc/day and a loss of 175 pounds lead/day. There are no primary sources between the Spokane River and the outlet from Long Lake. Long Lake acts as a depositional area for sediments and, undoubtedly, removes metals from surface waters concurrently with the sediment deposition and filtering. The same geochemical processes described in the CSM Unit 4 report on Coeur d'Alene Lake and summarized in Section 5.2.2.1 above, result in a net loss of zinc in surface water to lake bed sediments. There is an estimated gain of approximately 600 cfs in discharge between SR75 and SR85.

5.2.2.5 Concentrations Versus Discharge

The following discussion is based on evaluation of data (Appendix C) at SR50 at the Post Falls Dam. Contrary to most reaches within the Coeur d'Alene River basin, there is an estimated increase in dissolved zinc concentrations with increased discharge (log-log plot of concentrations versus discharge) which is significant at a = 0.08 (a is the probability the correlation is due to chance). To avoid cumbersome phrasing and repetition, discussions of regressions that follow tacitly assume that log-log plots are being described. As one would expect, given that the majority of the zinc is in the dissolved phase, there is also an increase in total zinc concentrations with increased discharge rates (a = 0.07). Regression plots of total lead concentrations versus discharge increased with increasing discharge (a < 0.002).

The regressions allow estimation of dissolved zinc and total lead concentrations at various discharge rates. Similar regressions were developed at the other sampling locations (Appendix C).

5.3 SEDIMENT FATE AND TRANSPORT

Sediment fate and transport processes were presented in Section 3 and in Part 1, Section 2.6. Results of the sediment transport evaluation presented in Section 3 are summarized in this section.

The Spokane River Watershed within the CSM boundary has an areal extent of approximately 34.7 square miles with approximately 110 miles of mapped channel. The total drainage area above the USGS gage at Long Lake, located approximately 31 miles upstream of the mouth, is approximately 6,020 square miles. The total drainage area of the entire basin from the mouth to the headwaters is roughly 6,560 square miles.

Much of the sediment derived in or introduced to the Spokane River is transported and deposited in reservoirs or locally along shorelines of the free-flowing reaches along its length. The largest sediment sources to the Spokane River are remobilization of channel bed material, bank erosion, and tributary channels. Most of the discharge in the Spokane River is derived from the outlet of Coeur d'Alene Lake. Groundwater recharge contribution is also prominent and is particularly important in the summer and fall. This lake provides a low energy environment where much of the sediment derived from upstream sources is deposited. Some of the smallest and lightest particles remain suspended through the lake and are transported to the Spokane River.

Sediment sources and transport processes were evaluated based on review and interpretation of aerial photographs. The review focused on morphologic features indicating stream instability, channel migration, channel aggregation or degradation and other features that may contribute sediment to the system. USGS sediment transport data are not available for the Spokane River; therefore, estimates of sediment yield are not included in this discussion.

Based on review of the aerial photographs, sediment transport throughout the Spokane River is controlled by dams and reservoirs. Fine-grained suspended sediment is transported through the reservoirs; however, considerable quantities of sediment are likely deposited in the reservoirs throughout the length of the Spokane River. The largest accumulation of sediment exists in the Long Lake reservoir, with most of the sediment currently coming from Hangman Creek.

5.4 SUMMARY OF FATE AND TRANSPORT

The probabilistic model was used to quantify and summarize the available data and to estimate metals concentrations in surface water and mass loading in the Spokane River.

Surface water discharge, metals concentrations (total and dissolved), and mass loading data were analyzed using lognormal PDFs at seven sampling locations in the Spokane River. Only results for lead and zinc were analyzed. No probabilistic analysis of cadmium was undertaken because cadmium concentrations were generally less than the reporting limit of 0.5 µg/L. Regressions were also developed for total and dissolved concentrations versus discharge. Probabilistic modeling and regression analysis results were used to quantify and identify trends in discharge, concentrations and mass loading. The percentages of dissolved and particulate forms of metals were computed from the estimated expected values predicted by the model.

Results of the probabilistic modeling indicate:

- All measured and plotted total lead concentrations for sampling location SR50 were less than the screening level (15 µg/L). The estimated expected total lead concentration (approximately 2 µg/L) also was less than the screening level.

- All dissolved zinc concentrations for sampling location SR50 are greater than the screening level (30 µg/L). The estimated expected dissolved zinc concentration (58 µg/L) was approximately twice the screening level.

- The estimated total lead load at SR50 is approximately 156 pounds/day. The estimated expected value exceeds the 90th percentile TMDL (20.0 pounds/day) established at Harrison by several fold. Some of the measured lead loads at SR50 are greater than 10 times the 90th percentile TMDL for Harrison on the Coeur d'Alene River.

- The estimated dissolved zinc load is approximately three times the 90th percentile TMDL (1,200 pounds/day) established at Harrison.

- There was a general trend of decreasing zinc concentrations with increasing downstream distance along the Spokane River. The largest decrease in zinc concentrations occurred between Spokane (SR75) and the outlet from Long Lake (SR85).

- There was no statistically significant increase or decrease in the estimated lead concentrations. The largest decrease in the estimated total lead concentrations and loads occurred between the City of Spokane (SR75) and the outlet from Long Lake (SR85).

- The only significant (when significant is defined as an $\alpha < 0.05$) correlation with discharge was total lead concentration increase with increasing discharge ($\alpha < 0.002$).

- Probabilistic modeling at SR55 indicated that essentially all of the zinc and approximately 40 percent of the lead was in the dissolved phase.

- The major source of metals to the Spokane River is Coeur d'Alene Lake.

To illustrate the observed trends of estimated expected values throughout the watershed, estimated expected values for lead and zinc concentrations and mass loading are shown in Figures 5.4-1 through 5.4-4. To illustrate the relationship between discharge, concentration, and mass loading, estimated expected values for these variables at each sampling location are plotted together for lead and zinc in Figures 5.4-5 and 5.4-6, respectively.

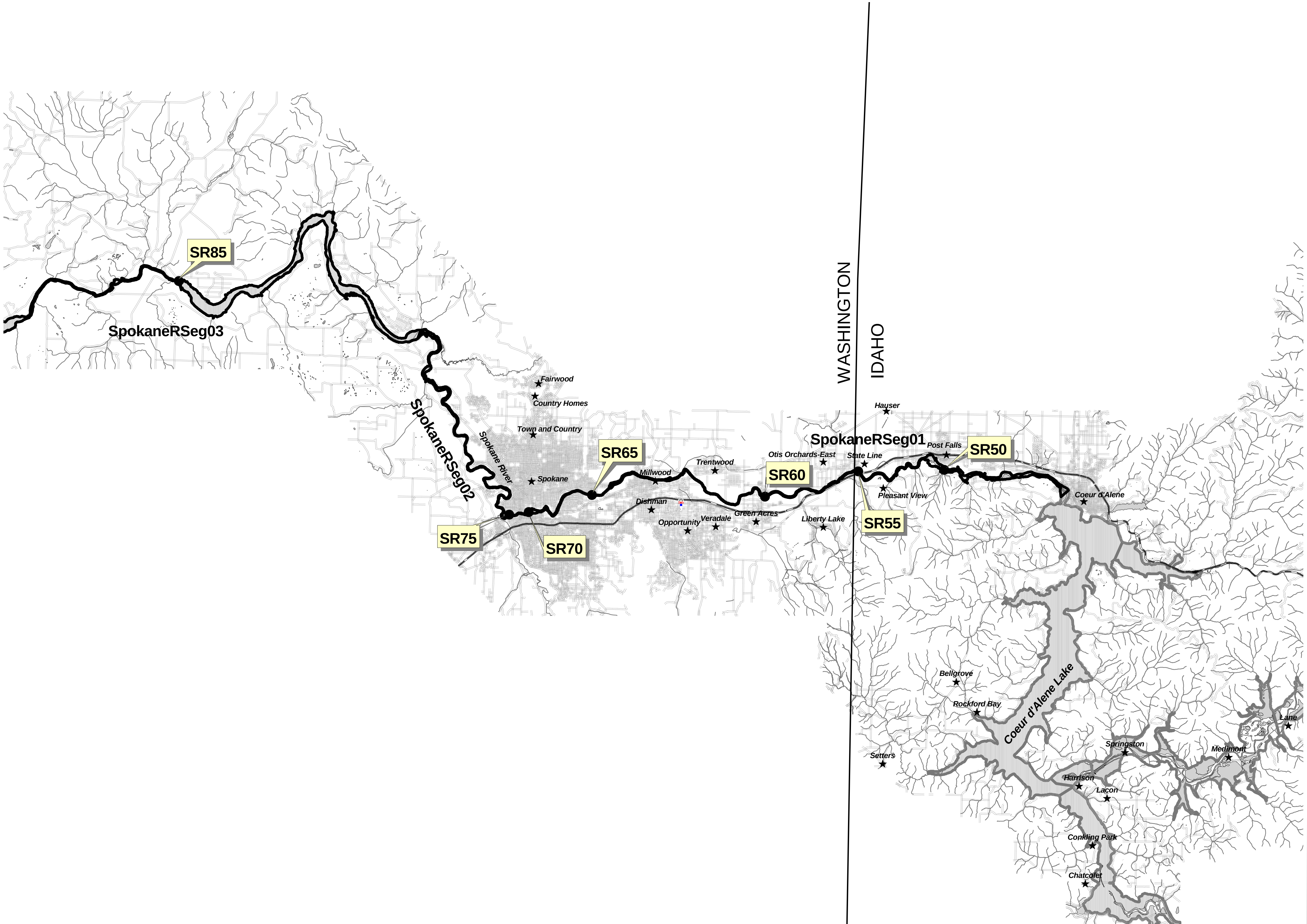
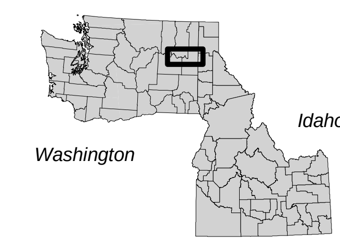


Figure 5.2-1
Spokane River Watershed Sampling Locations Evaluated in Probabilistic Modeling

LEGEND

- Sampling Location
- Stream
- Interstate 90
- Road
- City
- Spokane River Watershed
- River Segment
- Lake/River
- Source Area



Location Map

NOTES

1) Base map coverages obtained from the Coeur d'Alene Tribe, URS Greiner Inc., CH2M HILL, and the Bureau of Land Management.

SCALE 1:350,000

0 5 Miles

N

027-RI-C0-102Q
Coeur d'Alene Basin RI/FS
RI REPORT

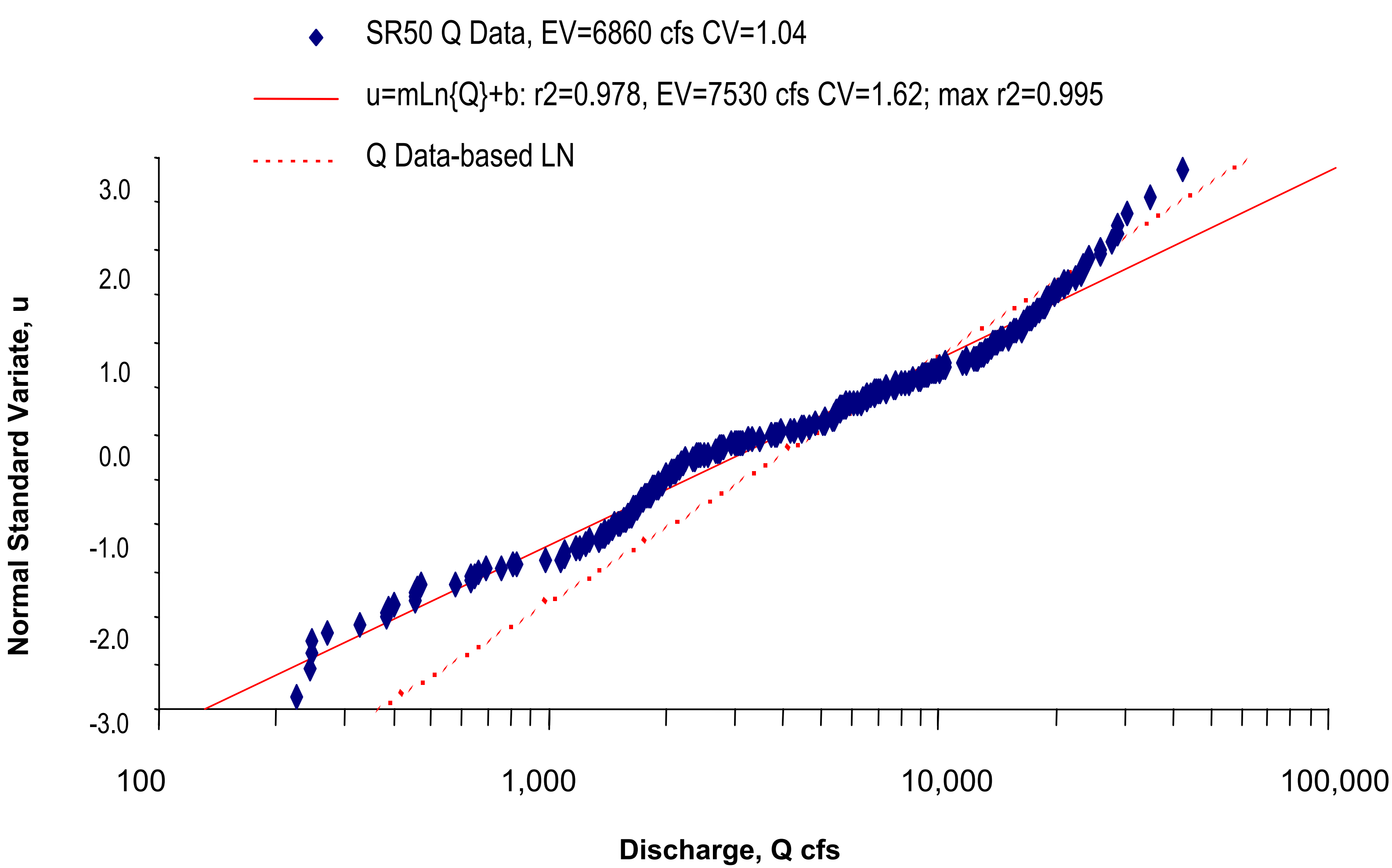
EPA REGION 10

Document Control 4162500.6615.05a
Generation 1
n:\Projects\watersheds\Spokane_River
Spokane_River_8-2.apr
V: SR Locate
E:SR Locate
L: Final RI SR Locatation
7/11/2001

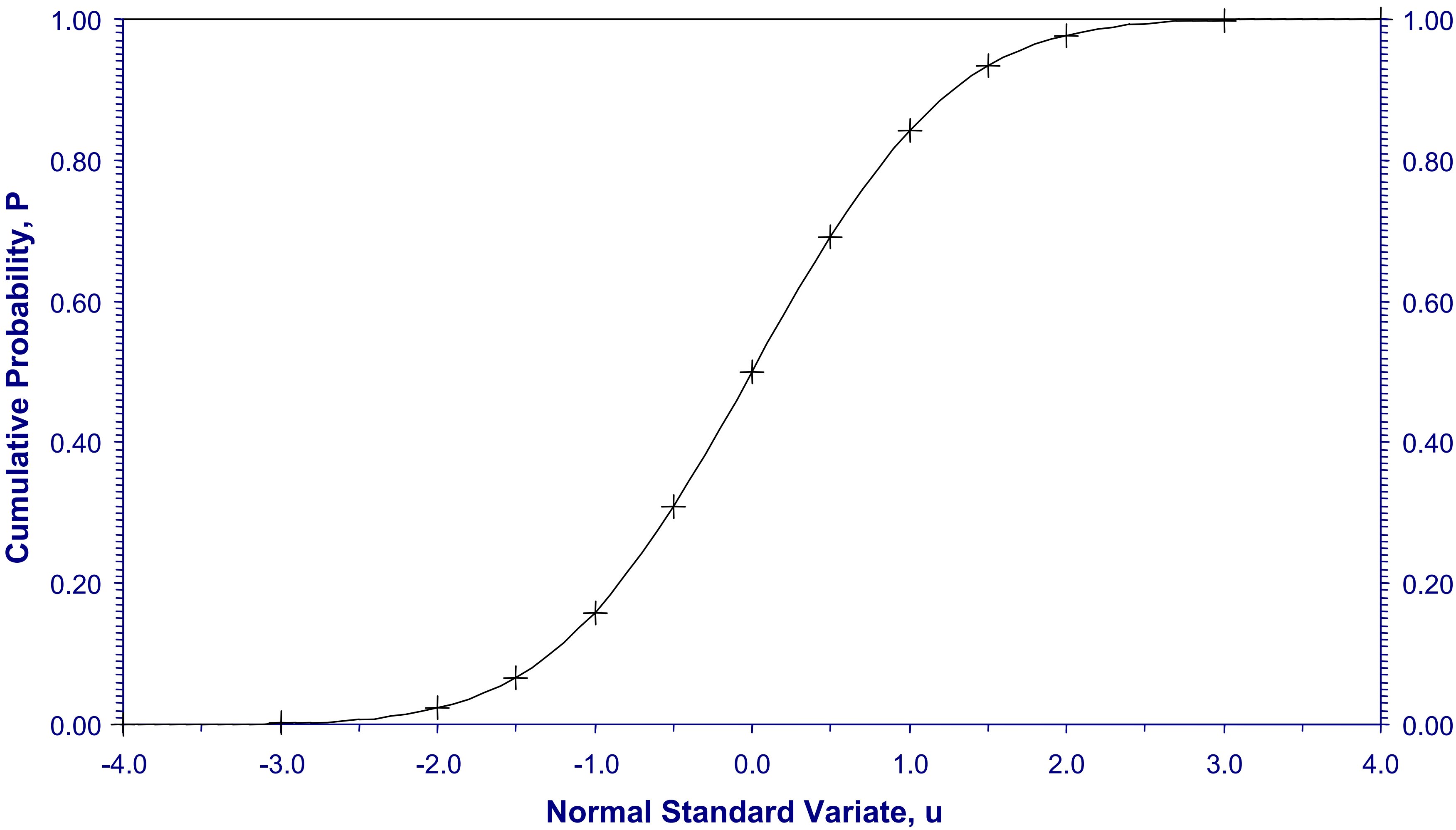
This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: July 11, 2001

Probabilistic Modeling Results for Discharge at SR50



Cumulative Probability Values Corresponding to Normal Standard Variate Values



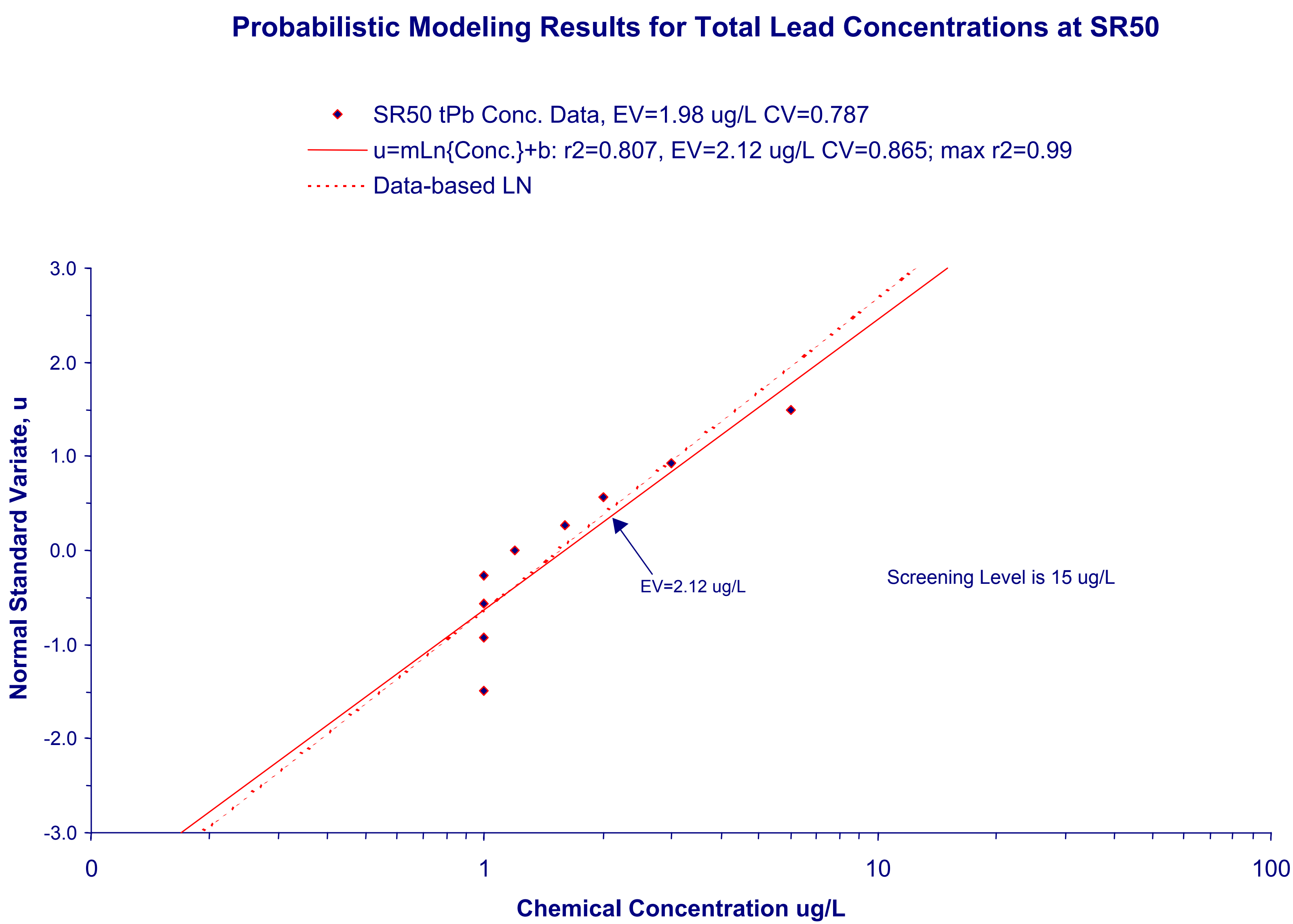
EPA REGION 10

027-RI-CO-102Q
Coeur d'Alene Basin RI/FS
RI REPORT

Doc Control: 4162500.6615.05.a
Generation: 1

Spokane River Series
6/20/01

Figure 5.2-3



EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS RI REPORT	Doc Control: 4162500.6615.05.a Generation: 1 Spokane River Series 6/20/01	**Figure 5.2-4**

Probabilistic Modeling Results for Dissolved Zinc Concentrations at SR50

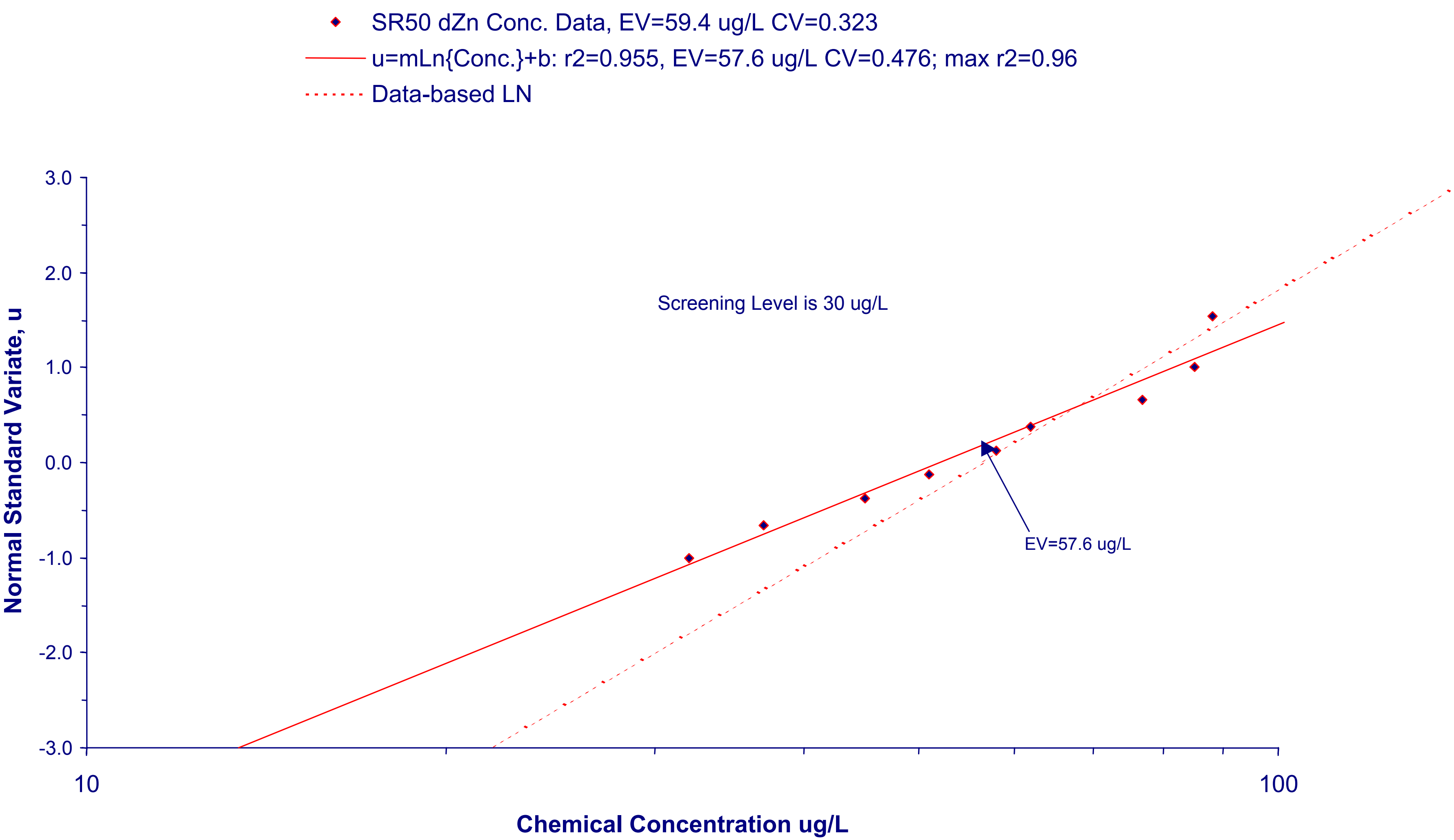
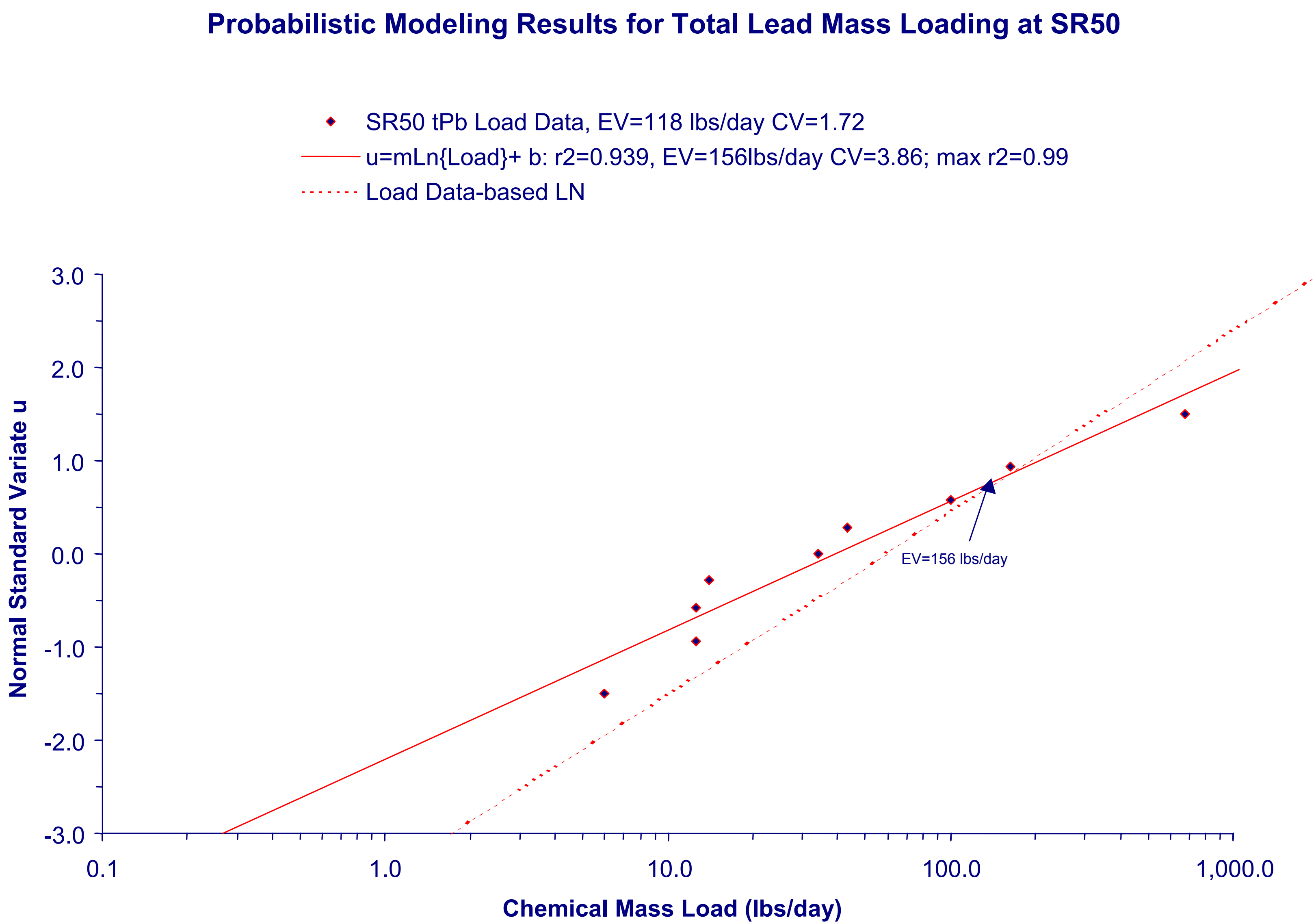
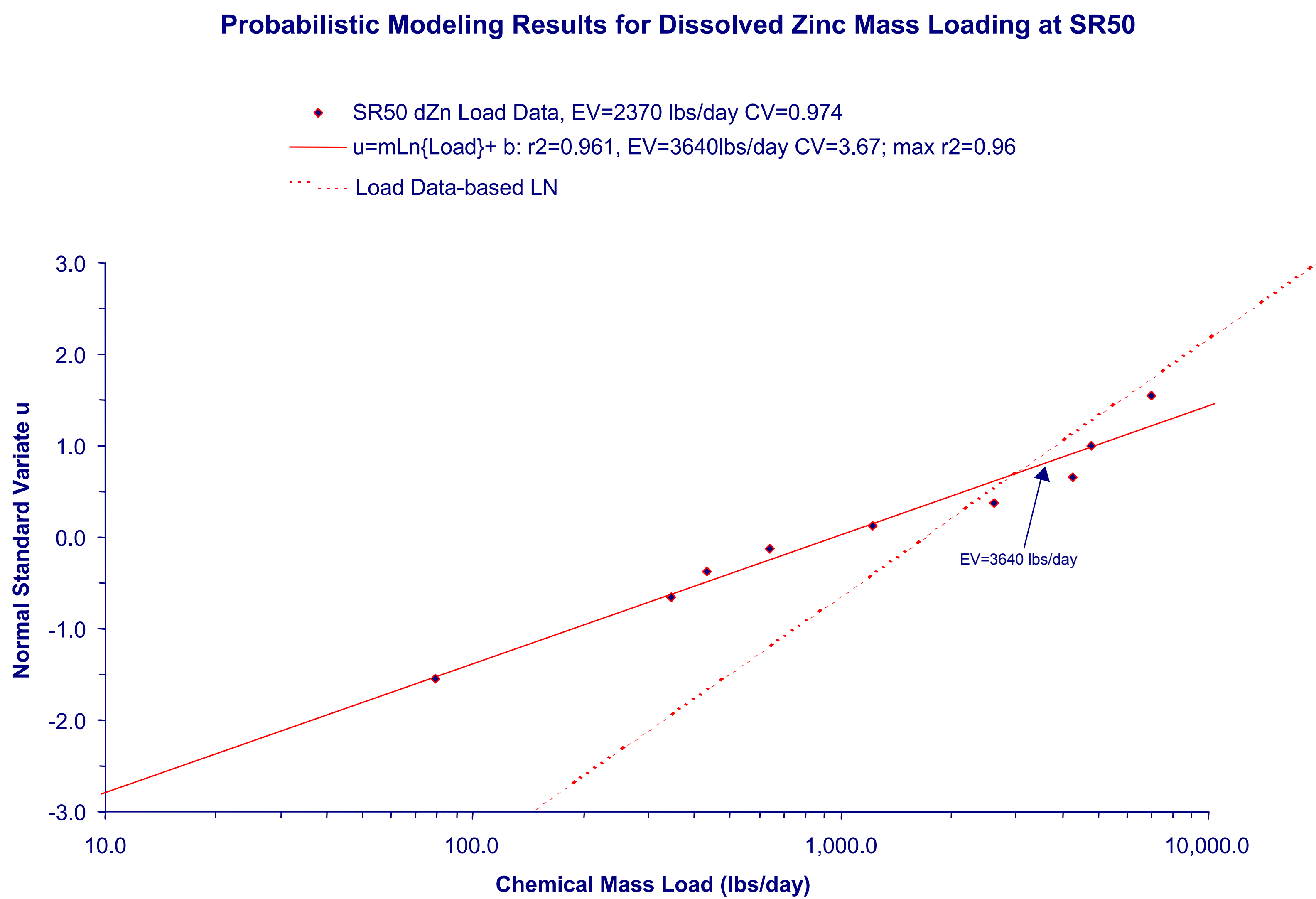


Figure 5.2-5

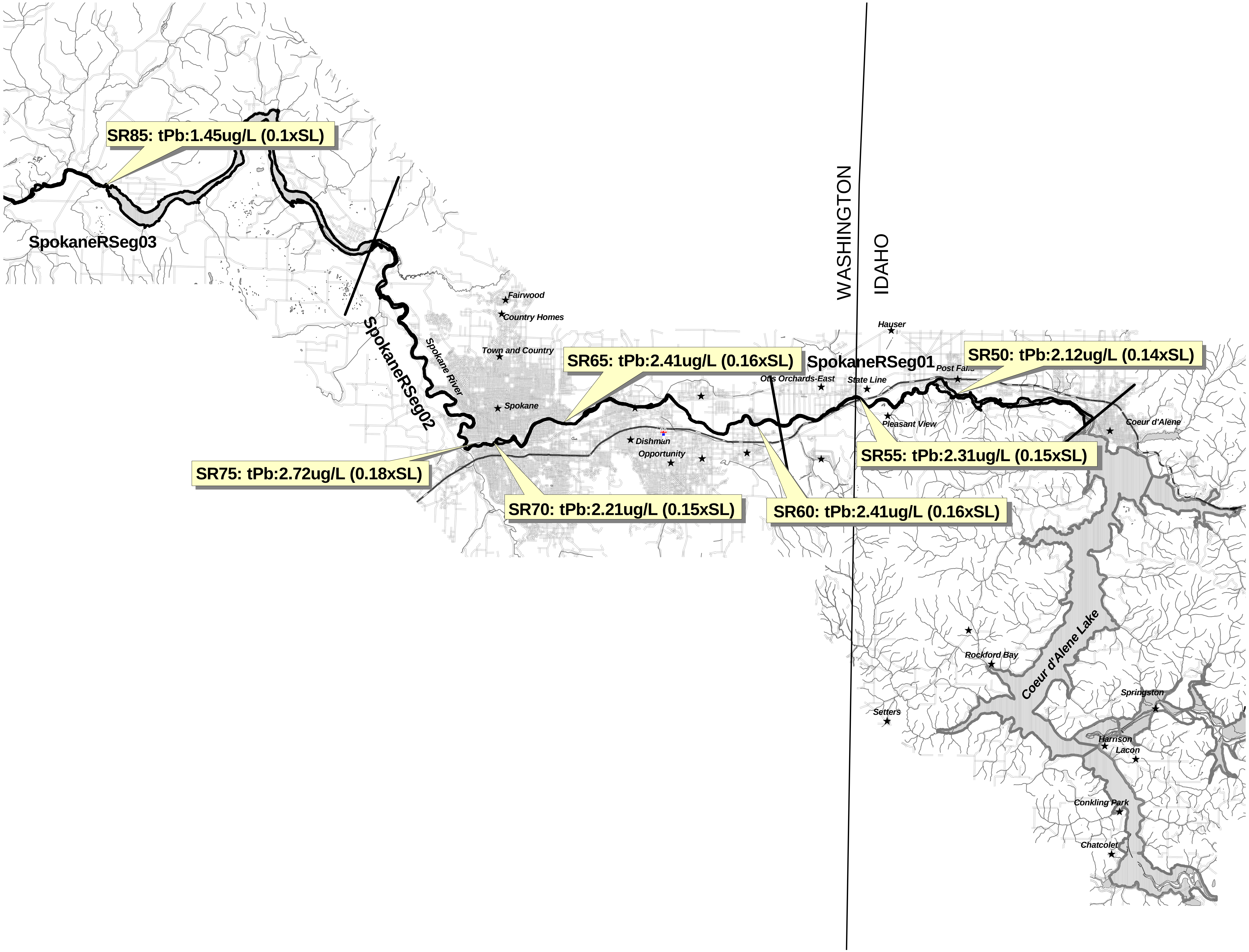


EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS RI REPORT	Doc Control: 4162500.6615.05.a Generation: 1 Spokane River Series 6/20/01	Figure 5.2-6



EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS RI REPORT	Doc Control: 4162500.6615.05.a Generation: 1 Spokane River Series 6/20/01	**Figure 5.2-7**

Figure 5.4-1
Spokane River Watershed
Estimated Expected Values for
Total Lead Concentrations



LEGEND

Sampling Location
Concentration
SR60 tPb: 2.4ug/L (0.16xSL)
Analyte
Screening Level is 15 ug/L

Range of Total Lead Concentrations in ug/L
- Range 0 - 5
- Range 5 - 10
- Range 10 - 50
- Range 50 - 100
- Range >100

- Stream
- Interstate 90
- Road
- City
- Spokane River Watershed
- River Segment
- Lake/River
- Source Area

Washington
Idaho

Location Map

NOTES

1) Base map coverages obtained from the Coeur d'Alene Tribe, URS Greiner Inc., CH2M HILL, and the Bureau of Land Management.

SCALE 1:350,000

0 5 Miles

N

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Coeur d'Alene Basin RI/FS
RI REPORT

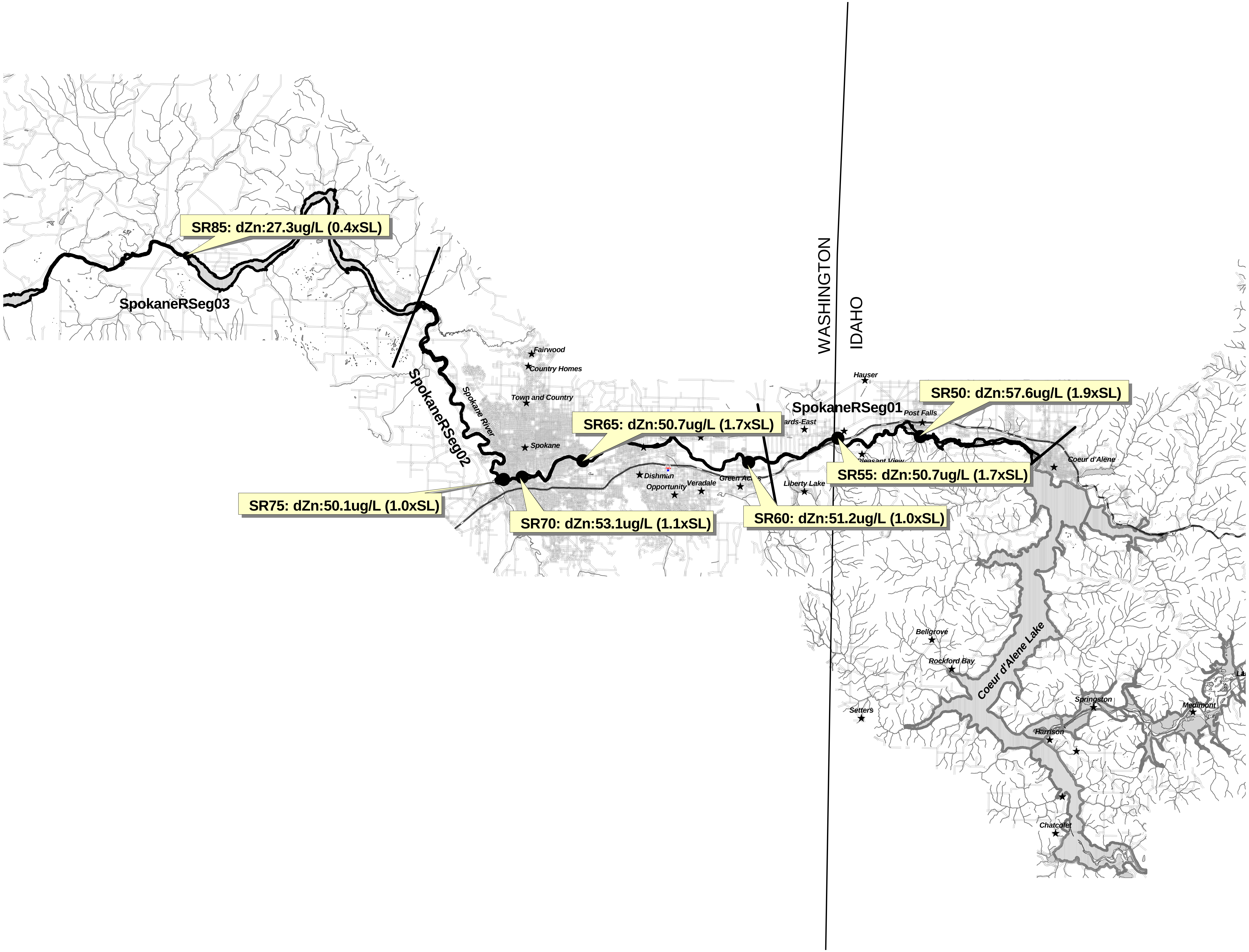
EPA REGION 10

Document Control 4162500.6615.05.a
Generation 1
n:\Projects\watersheds\Spokane_River\Spokane_River_8-2.apr
V:tPb concentrations
E:tPb
L: tPb Concentrations
7/11/2001

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: July 11, 2001

Figure 5.4-2
Spokane River Watershed
Estimated Expected Values for Dissolved Zinc Concentrations



LEGEND

Sampling Location — Concentration

SR60 dZn: 51.2ug/L (1.7xSL)

Analyte — Screening Level (See Note 2)

Range of Dissolved Zinc Concentrations in ug/L

- Range 0 - 10
- Range 10 - 50
- Range 50 - 100
- Range 100 - 150
- Range >150

- Stream
- Interstate 90
- Road
- City
- Spokane River Watershed
- River Segment
- Lake/River
- Source Area

Location Map

NOTES

1) Base map coverages obtained from the Coeur d'Alene Tribe, URS Greiner Inc., CH2M HILL, and the Bureau of Land Management.

2) Screening levels for dissolved zinc are hardness dependent
Seg01 = 30 ug/L
Seg02 = 50 ug/L
Seg03 = 75 ug/L

SCALE 1:350,000

0 — 5 Miles

N

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Coeur d'Alene Basin RI/FS
RI REPORT

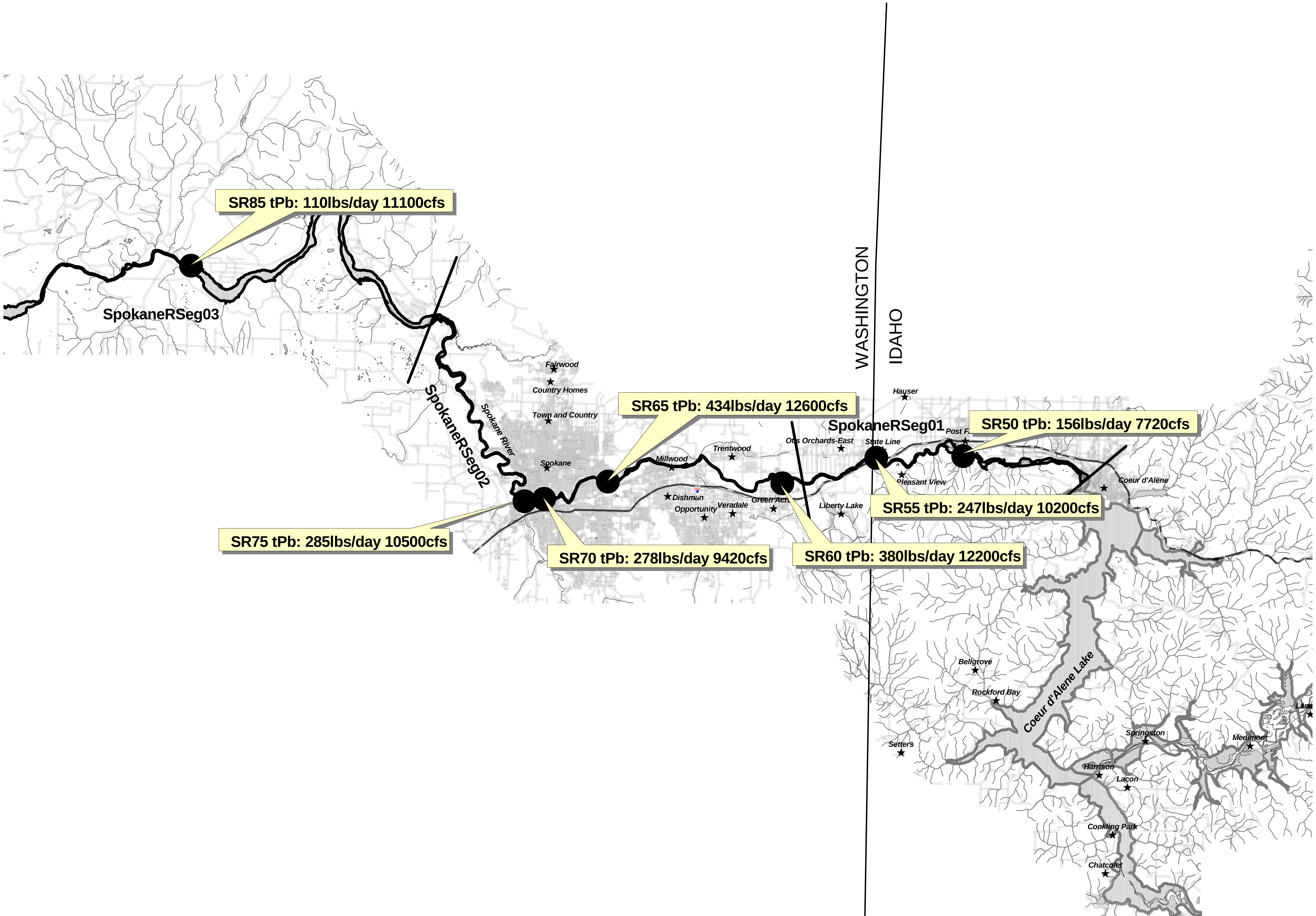
EPA REGION 10

Document Control 4162500.6615.05.a
Generation 1
n:\Projects\watersheds\Spokane_River\Spokane_River_8-2.apr
V:dZn concentrations
E:SR ev
L: Final RI dZn concentrations
7/11/01

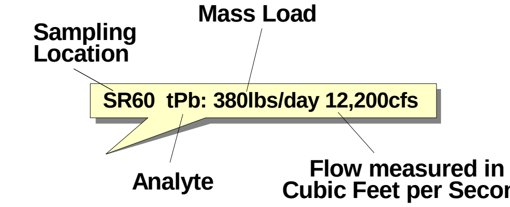
This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: July 11, 2001

Figure 5.4-3
Spokane River Watershed Estimated Expected Values for Total Lead Mass Loading



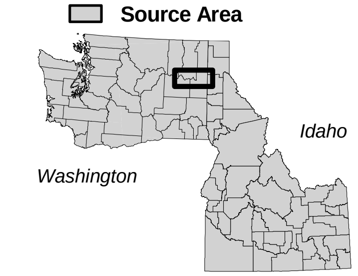
LEGEND



Range of Total Lead Mass Loading in lbs/day

- Range 0 - 5
- Range 5 - 10
- Range 10 - 50
- Range 50 - 100
- Range >100

- Stream
- Interstate 90
- Road
- City
- Spokane River Watershed
- River Segment
- Lake/River
- Source Area



Location Map

NOTES

1) Base map coverages obtained from the Coeur d'Alene Tribe, URS Greiner Inc., CH2M HILL, and the Bureau of Land Management.

SCALE 1:350,000

0 5 Miles

027-RI-C0-102Q
Coeur d'Alene Basin RI/FS
RI REPORT

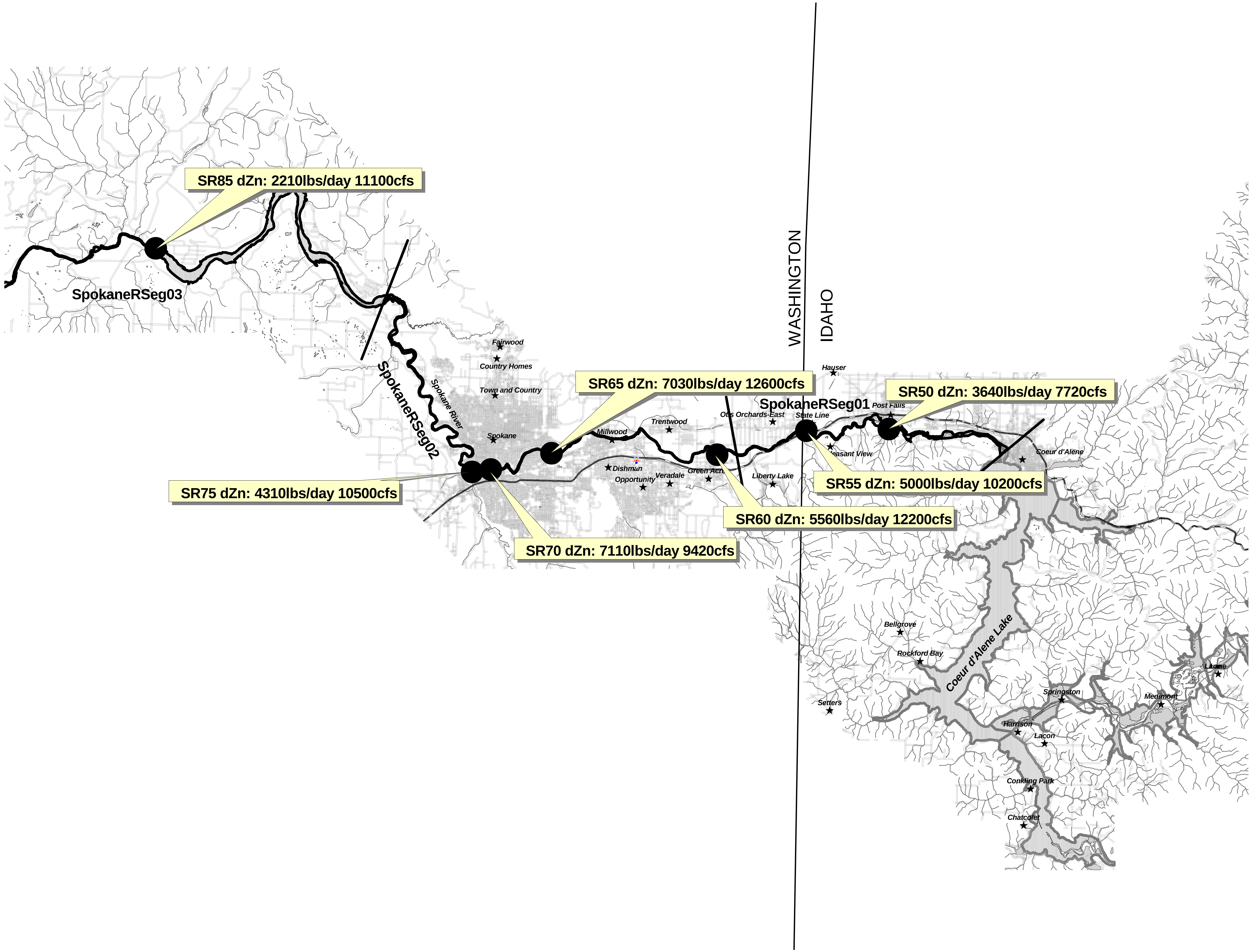
EPA REGION 10

Document Control 4162500.6615.05.a
Generation 1
n:\Projects\watersheds\lSpokane_River
Spokane_River_8-2.apr
V:tPb massloading
E:SR_EV
L: Final RI tPb Massloading
7/12/01

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: July 12, 2001

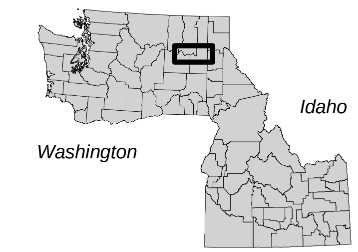
Figure 5.4-4
Spokane River Watershed
Estimated Expected Values for
Dissolved Zinc Mass Loading



LEGEND

Range of Dissolved Zinc Mass Loading in lbs/day

- Range 0 - 100
- Range 100 - 500
- Range 500 - 1000
- Range 1000 - 1500
- Range >1500
- Stream
- Interstate 90
- City
- Bunker Hill Site
- Spokane River Watershed
- River Segment
- Lake/River
- Source Area



Location Map

NOTES

1) Base map coverages obtained from the Coeur d'Alene Tribe, URS Greiner Inc., CH2M HILL, and the Bureau of Land Management.

SCALE 1:350,000

0 5 Miles

N

027-RI-C0-102Q
Coeur d'Alene Basin RI/FS
RI REPORT

EPA REGION 10

Document Control 4162500.6615.05.a
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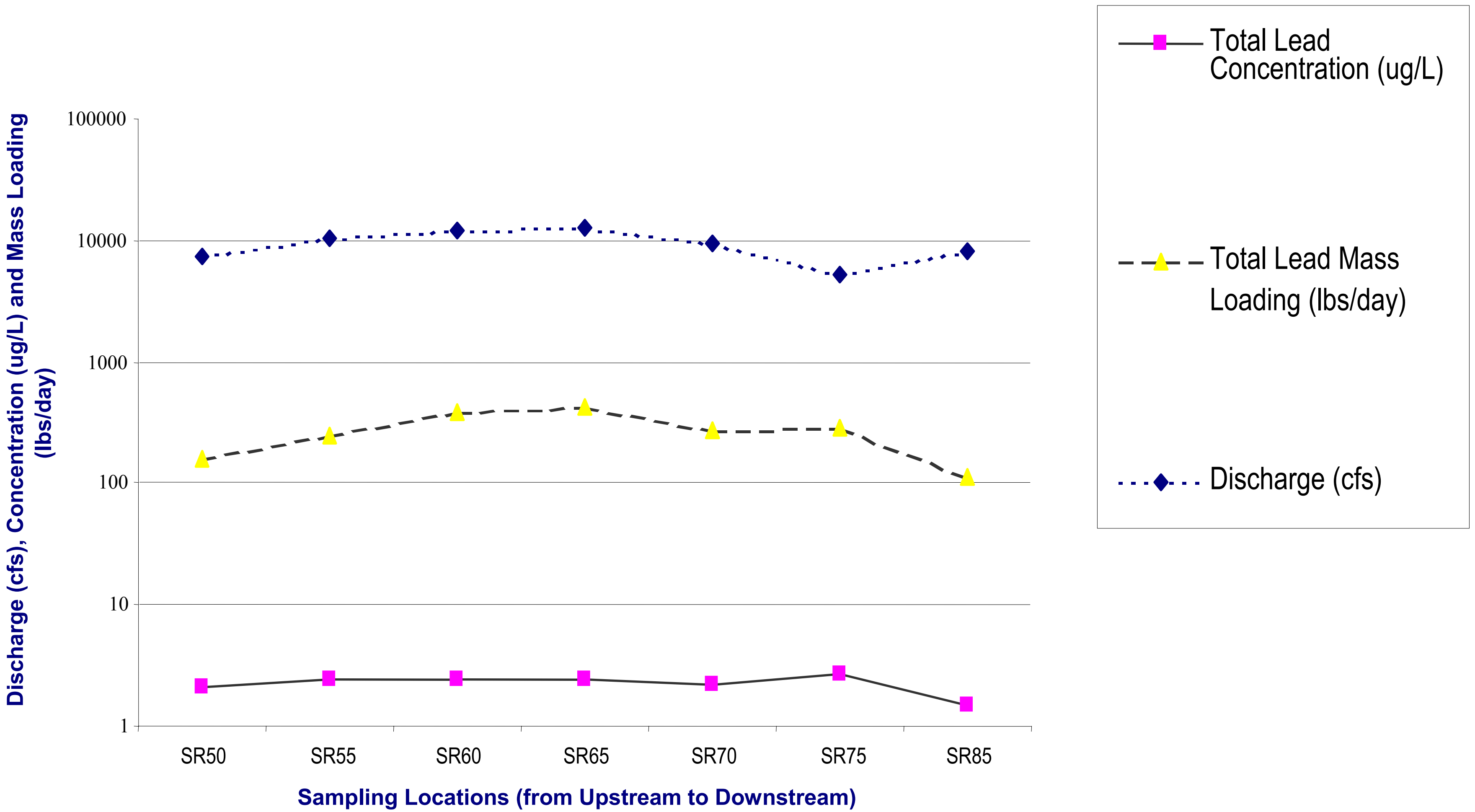
V:dZn Massloading
E:dZn
L: Final RI dZn Massloading
7/11/01

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

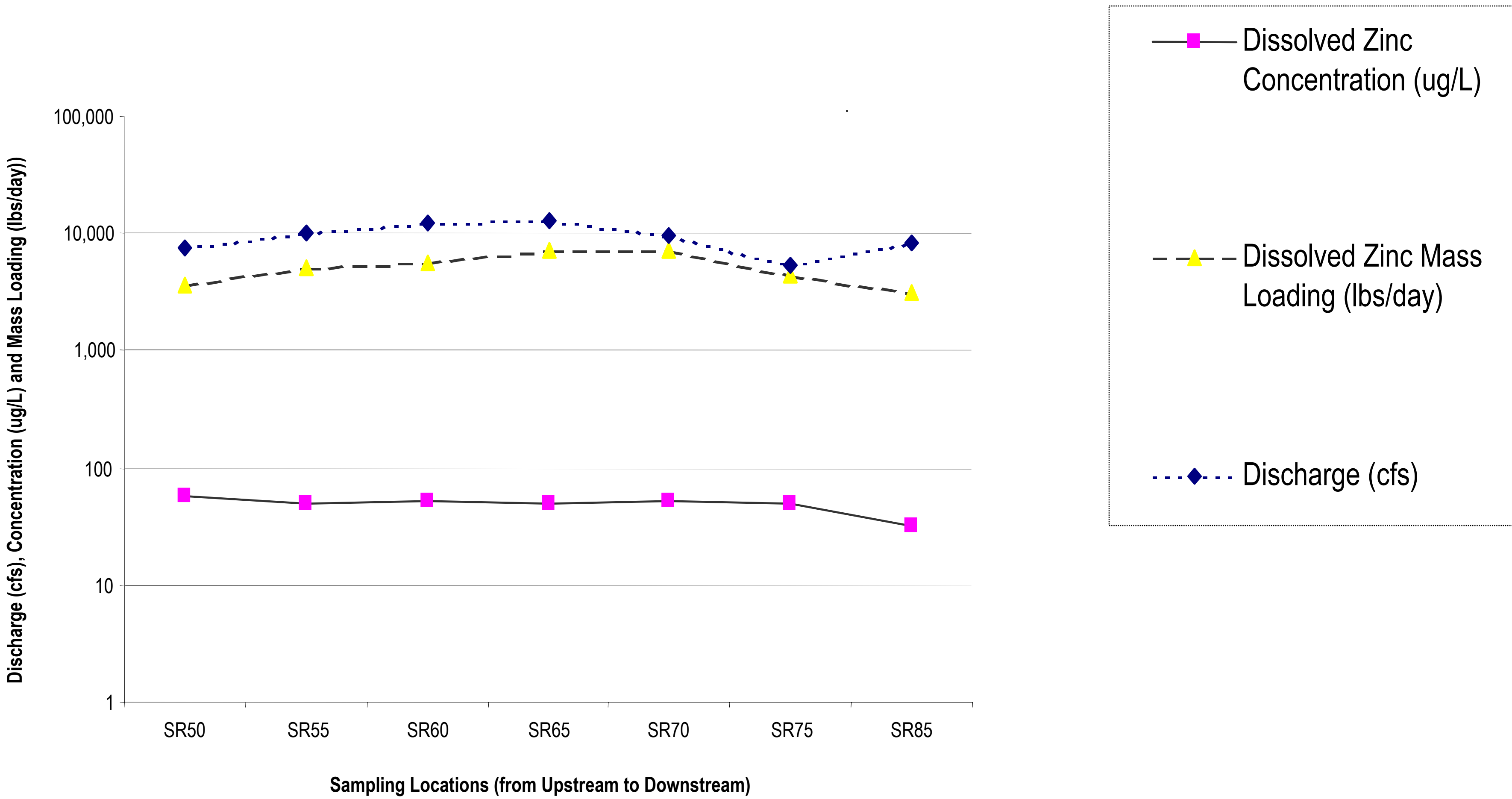
Date of Plot: July 11, 2001

Estimated Expected Values for Discharge, Total Lead Concentrations and Total lead Mass Loading



EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS RI REPORT	Doc Control: 4162500.6615.05.a Generation: 1 Spokane River Series 6/20/01	**Figure 5.4-5**

Estimated Expected Values for Discharge, Dissolved Zinc Concentrations and Dissolved Zinc Mass Loading



EPA REGION 10

027-RI-CO-102Q
Coeur d'Alene Basin RI/FS
RI REPORT

Doc Control: 4162500.6615.05.a
Generation: 1

Spokane River Series
6/20/01

Figure 5.4-6

Table 5.2-1
Estimated Expected Values of Concentrations and Loads

Sampling Location	Concentration (µg/L)		Mass Loading (pounds/day)		Discharge (cfs)	Mean Daily Discharge (cfs)[1]
	Total Lead	Dissolved Zinc	Total Lead	Dissolved Zinc		
Screening Level or TMDL	15	Seg01 = 30 Seg02 = 50 Seg03 = 75	NA	NA	--	--
SR50	2.12 (cv = 0.865)	**57.6** (cv = 0.476)	156 (cv = 3.86)	3,640 (cv = 3.67)	7,530 (cv = 1.62)	7,530
SR55	2.31 (cv = 0.768)	**50.7** (cv = 0.524)	247 (cv = 5.68)	5,000 (cv = 4.65)	10,200 (cv = 2.11)	NA
SR60	2.41 (cv = 0.923)	**51.2** (cv = 0.466)	380 (cv = 9.19)	5,560 (cv = 5.06)	12,200 (cv = 2.64)	NA
SR65	2.41 (cv = 0.965)	**50.7** (cv = 0.606)	434 (cv = 10.4)	7,030 (cv = 6.7)	12,600 (cv = 2.66)	NA
SR70	2.21 (cv = 1.13)	**53.1** (cv = 1.22)	278 (cv = 6.45)	7,110 (cv = 7.24)	9,420 (cv = 1.94)	NA
SR75	2.72 (cv = 1.02)	**50.1** (cv = 0.578)	285 (cv = 3.81)	4,310 (cv = 2.41)	5,260 (cv = 1.27)	7,530
SR85	1.45 (cv = 0.498)	27.3 (cv = 1.74)	110 (cv = 0.99)	2,210 (cv = 3.12)	8,120 (cv = 0.845)	9,240

[1]Mean daily values for water year 1999 from continuous measurements of streamflow (USGS 2000).

Notes:
TMDLs for mass loading have not been established for the Spokane River. Complete modeling results are included in Appendix C.
cv - coefficient of variation
NA - not available
TMDL - total maximum daily load
Bold indicates exceedence of screening level

Table 5.2-2
Estimated Gains or Losses in Discharge

Reach - Between Location Xi and Xj (# of Samples), [Segment]	Estimated Expected Value of Gain or Loss (EV[X]) in Discharge, cfs	Coefficient of Variation (CV) for Reach (pxi,xj = 0.9)
SR50 (298), [SpokaneRSeg01], and SR55 [SpokaneRSeg01]	2,670	4.4
SR55 (7) and SR60 [SpokaneRSeg02]	2,000	8.0
SR60 (7) and SR65 [SpokaneRSeg02]	400	36.9
SR65 (7) and SR70 [SpokaneRSeg02]	-3,180	7.0
SR70 (7) and SR75 [SpokaneRSeg02]	-4,160	1.9
SR75 (31) and SR85 (194) [SpokaneRSeg03]	2,860	1.1

Table 5.2-3
Estimated Gains or Losses for Dissolved Zinc Concentrations and Dissolved Load

Reach - Between Location Xi and Xj (# of Samples), [Segment]	Estimated Expected Value of Increase or Decrease in the Dissolved Concentrations of Zinc (µg/L)	Estimated Coefficient of Variation (CV) for Dissolved Zinc Concentrations ($p_{xi,xj}$ = 0.9)	Estimated Expected Value of Gain or Loss in the Dissolved Zinc Load (lbs/day)	Estimated Coefficient of Variation (CV) for the Dissolved Zinc Load ($p_{xi,xj}$ = 0.9)
SR50 (10), [SpokaneRSeg01], and SR55 [SpokaneRSeg01]	-6.9	1.8	1,360	9.3
SR55 (7) and SR60 [SpokaneRSeg02]	0.5	23.2	560	22.2
SR60 (7) and SR65 [SpokaneRSeg02]	-0.5	27.8	1,470	17.0
SR65 (7) and SR70 [SpokaneRSeg02]	2.4	16.4	80	280.6
SR70 (7) and SR75 [SpokaneRSeg02]	-3.0	13.6	-2,800	15.1
SR75 (9) and SR85 (13), [SpokaneRSeg03]	-22.8	1.1	-2,100	2.5

Table 5.2-4
Estimated Gains or Losses for Total Lead Concentrations and Total Load

Reach - Between Location Xi and Xj (# of Samples), [Segment]	Estimated Expected Value of Increase or Decrease in the Total Concentration of Lead (µg/L)	Estimated Coefficient of Variation (CV) for Total Lead Concentrations ($p_{xi,xj}$ = 0.9)	Estimated Expected Value of Gain or Loss in the Total Lead Load (lbs/day)	Estimated coefficient of variation (CV) for the total lead load ($p_{xi,xj}$ = 0.9)
SR50 (10), [SpokaneRSeg01], and SR55 [SpokaneRSeg01]	0.19	4.3	91.0	9.9
SR55 (7) and SR60 [SpokaneRSeg02]	0.1	10	133.0	17.4
SR60 (7) and SR65 [SpokaneRSeg02]	0	NA	54.0	37.9
SR65 (7) and SR70 [SpokaneRSeg02]	-0.2	5.5	-156.0	19.3
SR70 (7) and SR75 [SpokaneRSeg02]	0.51	2.4	7.0	134.7
SR75 (9) and SR85 (13), [SpokaneRSeg03]	-1.27	1.7	-175.0	5.7

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ATTACHMENT 1
Data Source References

Data Source References

Data Source References[a]	Data Source Name	Data Source Description	Reference
2	URS FSPA Nos. 1, 2, and 3	Fall 1997: Low Flow and Sediment Sampling	URS Greiner Inc. 1997. Field Sampling Plan Addendum 1 Sediment Coring in the Lower Coeur d'Alene River Basin, Including Lateral Lakes and River Floodplains
			URS Greiner Inc. 1997. Field Sampling Plan Addendum 2 Adit Drainage, Seep and Creek Surface Water Sampling
			URS Greiner Inc. 1997. Field Sampling Plan Addendum 3 Sediment Sampling Survey in the South Fork of the Coeur d'Alene River, Canyon Creek, and Nine-Mile Creek
3	URS FSPA No. 4	Spring 1998: High Flow Sampling	URS Greiner Inc. 1998. Field Sampling Plan Addendum 4 Adit Drainage, Seep and Creek Surface Water Sampling; Spring 1998 High Flow Event
4	MFG Historical Data Spring 1991	Spring 1991: High Flow Sampling	McCulley, Frick & Gillman, Inc. 1991. Upstream Surface Water Sampling Program Spring 1991 High Flow Event, South Fork Coeur d'Alene River Basin above Bunker Hill Superfund Site: Tables 1 and 2
5	MFG Historical Data Fall 1991	Fall 1991: Low Flow Sampling	McCulley, Frick & Gillman, Inc. 1992. Upstream Surface Water Sampling Program Fall 1991 Low Flow Event, South Fork Coeur d'Alene River Basin above Bunker Hill Superfund Site: Tables 1 and 2
6	EPA/Box Historical Data	Superfund Site Groundwater and Surface Water Data	CH2MHill. 1997. Location of Wells and Surface Water Sites, Bunker Hill Superfund Site. Fax Transmission of Map August 11, 1998
			Environmental Protection Agency. 1998. E-mail from Ben Cope July 15, 1998. Subject: 2 Datasets File Attached: BOXDATA.WK4
7	IDEQ Historical Data	IDEQ Water Quality Data	Idaho Department of Environmental Quality. 1998. Assortment of files from Glen Pettit for water years 1993 through 1996
			Idaho Department of Environmental Quality. 1998. E-mail from Glen Pettit October 6, 1998 Subject: DEQ Water Quality Data Files Attached: 1998 trend Samples.xls, 1997 trend Samples.xls

Data Source References (Continued)

Data Source References[a]	Data Source Name	Data Source Description	Reference
8	EPA/NPDES Historical Data	Water Quality based on NPDES Program	Environmental Protection Agency. 1998. E-mail from Ben Cope August 11, 1998/September 2, 1998. Subject: Better PCS Data Files/Smelterville. Attached: PCS2.WK4, PCSREQ.698/TMT-PLAN.XLS
			Environmental Protection Agency. 1998. E-mail from Ben Cope August 5, 1998. Subject: State of Idaho Lat/Longs File Attached: PAT.DBF
			Environmental Protection Agency. 1998. E-mail from Ben Cope July 15, 1998. Subject: 2 Datasets File Attached: PCSDATA.WK4
10	URS FSPA No. 5	Common Use Areas Sampling	URS Greiner Inc. 1998. Field Sampling Plan Addendum 5 Common Use Areas: Upland Common Use Areas and Lower Basin Recreational Beaches; Sediment/Soil, Surface Water, and Drinking Water Supply Characterization
11	URS FSPA No. 8	Source Area Sampling	URS Greiner Inc. 1998. Field Sampling Plan Addendum 8 Tier 2 Source Area Characterization Field Sampling Plan
12	Historical Groundwater Data from MFG	1997 Annual Groundwater Data Report Woodland Park	McCulley, Frick & Gillman. 1998. 1997 Annual Groundwater Data Report Woodland Park
13	Historical Data from US Forest Service, Idaho Geological Survey and others	Historical Data on Inactive Mine Sites USFS, IGS and CCJM, 1994-1997, Prichard Creek, Pine Creek and Summit Mining District	Mackey K, Yarbrough, S.L. 1995. Draft Removal Preliminary Assessment Report Pine Creek Millsites, Coeur d'Alene District, Idaho, Contract No. 1422-N651-C4-3049
			Idaho Geological Survey. 1999. Site Inspection Report for the Abandoned and Inactive Mines in Idaho on U.S. Forest Service Lands (Region 1), Idaho Panhandle National Forest Vol. I, Prichard Creek and Eagle Creek Drainages
			Idaho Geological Survey. 1999. Site Inspection Report for the Abandoned and Inactive Mines in Idaho on U.S. Forest Service Lands (Region 1), Idaho Panhandle National Forest Vol. III, Coeur d'Alene River Drainage Surrounding the Coeur d'Alene Mining District (Excluding the Prichard Creek and Eagle Creek Drainages)
			Idaho Geological Survey. 1999. Site Inspection Report for the Abandoned and Inactive Mines in Idaho on U.S. Forest Service Lands (Region 1), Idaho Panhandle National Forest Vol. IV, Prichard Creek and Eagle Creek Drainages

Data Source References (Continued)

Data Source References[a]	Data Source Name	Data Source Description	Reference
13	Historical Data from US Forest Service, Idaho Geological Survey and others (continued)		Idaho Geological Survey. 1999. Site Inspection Report for the Abandoned and Inactive Mines in Idaho on U.S. Forest Service Lands (Region 1), Idaho Panhandle National Forest Vol. V, Coeur d'Alene River Drainage Surrounding the Coeur d'Alene Mining District (Excluding the Prichard Creek and Eagle Creek Drainages) Part 2 Secondary Properties
			US Forest Service. 1995. Pilot Inventory of Inactive and Abandoned Mine Lands, East Fork Pine Creek Watershed, Shoshone County, Idaho
14	Historical Sediment Core Data: University of Idaho (Thesis papers)	Historical Lateral Lakes Sediment Data from F. Rabbi and M.L. Hoffman	Characterization of Heavy Metal Contamination in Two Lateral Lakes of the Lower Coeur d'Alene River Valley, A thesis by M.L. Hoffmann, May 1995
			Trace Element Geochemistry of Bottom Sediments and Waters from the Lateral Lakes of Coeur d'Alene River, A Dissertation by F. Rabbi, May 1994
15	URS FSPA No. 9	Source Area Characterization; Field XRF Data	CH2M Hill and URS Greiner. 1998. Field Sampling Plan Addendum 9 Delineation of Contaminant Source Areas in the Coeur d'Alene Basin using Survey and Hyperspectral Imaging Techniques
16	Historical Sediment Data	Electronic Data compiled by USGS	U.S. Geological Survey. 1992. Effect of Mining-Related Activities on the Sediment-Trace Element Geochemistry of Lake Coeue d'Alene, Idaho, USA--Part 1: Surface Sediments, USGS Open-File Report 92-109, Prepared by A.J. Horowitz, K.A. Elrick, and R.B. Cook
			US Geological Survey. 2000. Chemical Analyses of Metal-Enriched Sediments, Coeur d'Alene Drainage Basin, Idaho: Sampling, Analytical Methods, and Results. Draft. October 13, 2000. Prepared by S.E. Box, A.A. Bookstrom, M. Ikramuddin, and J. Lindsey. Samples collected from 1993 to 1998.

Data Source References (Continued)

Data Source References[a]	Data Source Name	Data Source Description	Reference
17	USGS Spokane River Basin Sediment Samples	Surface Sediment Samples Collected by USGS in the Spokane River Basin	Environmental Protection Agency. 1999. Data Validation Memorandum and Attached Table from Laura Castrilli to Mary Jane Nearman dated June 9, 1999. Subject: Coeur d'Alene (Bunker Hill) Spokane River Basin Surface Sample Samples, USGS Metals Analysis, <63 um fraction, Data Validation, Samples SRH7-SRH30
18	USGS Snomelt Surface Water Data	Surface Water Data from 1999 Snomelt Runoff Hydrograph	USGS. 1999. USGS WY99.xls Spreadsheet dowloaded from USGS (Coeur d'Alene Office) ftp site
			USGS. 2000. Concentrations and Loads of Cadmium, Lead and Zinc Measured near the Peak of the 1999 Snomelt Runoff Hydrograph at 42 Stations, Coeur d'Alene River Basin Idaho
			USGS. 2000. Concentrations and Loads of Cadmium, Lead and Zinc Measured on the Ascending and Descending Limbs of the 1999 Snomelt Runoff Hydrograph at Nine Stations, Coeur d'Alene River Basin Idaho
22	MFG Report on Union Pacific Railroad Right-of-Way Soil Sampling	Surface and Subsurface Soil Lead Data	MFG. 1997. Union Pacific Railroad Wallace Branch, Rails to Trails Conversion, Right-of-Way Soil Sampling, Summary and Interpretation of Data. McCulley, Frick and Gilman, Inc. March 14, 1997
23	URS FSPA No. 11A	Source Area Groundwater and Surface Water Sampling	URS Greiner Inc. 1999. Field Sampling Plan Addendum 11A Tier 2 Source Area Characterization
24	URS FSPA No. 15	Common Use Area Sampling—Spokane River	URS Greiner Inc. 1999. Field Sampling Plan Addendum 15 Spokane River - Washington State Common Use Area Sediment Characterization
25	URS FSPA No. 18	Depositional and Common Use Area Sediment Sampling - Spokane River	URS Greiner Inc. 2001. Final Field Sampling Plan Addendum No. 18, Fall 2000 Field Screening of Sediment in Spokane River Depositional Areas, Summary of Results. Revision 1. January 2001
28	USGS National Water Quality Assessment database	Surface water data for sampling location NF50 at Enaville, Idaho	USGS. 2001. USGS National Water Quality Assessment database: http://infotrek.er.usgs.gov/pls/nawqa/nawqa.wwv_main.gohome. Data retrieved on August 2, 2001 for station 12413000, NF Coeur d'Alene River at Enaville, Idaho

[a]Reference Number is the sequential number used as cross reference to associate chemical results in data summary tables with specific data collection efforts.

ATTACHMENT 2
Data Summary Tables

ABBREVIATIONS USED IN DATA SUMMARY TABLE

LOCATION TYPES:

AD	adit
BH	borehole
FP	flood plain
GS	ground surface/near surface
HA	hand auger boring
LK	lake/pond/open reservoir
OF	outfall/discharge
RV	river/stream
SP	stockpile
TL	tailings pile

QUALIFIERS:

U	Analyte was not detected above the reported detection limit
J	Estimated concentration

DATA SOURCE REFERENCES:

Data source references listed in Attachment 1 are shown in the data summary tables in the "Ref" column.

Data Summary Table
Spokane River - segment SpokaneRSeg01

Boxed Sample Results Exceed Screening Level By More Than 1X

Shaded Sample Results Exceed Screening Level By More Than 10X

Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Surface Soil (mg/kg)														
CUA0031	GS	10	08/04/1998	0	1.3 J	8.4	0.26 J	23	22500	21.7	608	0.1 U	0.41 U	78.4 J
CUA0032	GS	10	08/04/1998	0	1.1 U	10.2	0.34 J	24.3	24700	65.6	373	0.11 U	0.45 U	139 J
CUA00329	GS	10	08/06/1998	0	1.1 U	28.1	0.51 J	29.3	26200	34.8	690	0.11 U	0.45 U	144
CUA0033	GS	10	08/07/1998	0	1 U	6.8	0.25 J	17.2	16900	17.8	536	0.1 U	0.42 U	105 J
CUA00330	GS	10	08/06/1998	0	1 U	15.2	0.61 J	16.8	17500	19.6	447	0.1 U	0.42 U	155 J
CUA00331	GS	10	08/06/1998	0	1 U	12.7	0.21 U	10.6	12100	11.2	259	0.1 U	0.42 U	37.5 J
CUA0034	GS	10	08/04/1998	0	1 U	2.6	0.21 U	12.1	14600	15.5	205	0.1 U	0.42 U	38.6 J
CUA0035	GS	10	08/04/1998	0	1.5 J	8.9	0.4 J	20.7	17300	34.2	398	0.1 U	0.43 U	114 J
CUA0036	GS	10	08/04/1998	0	1.1 J	7.9	0.33 J	19.9	17900	28.1	599	0.11 U	0.44 U	123 J
CUA0037	GS	10	08/04/1998	0	1.2 J	8.3	0.34 J	19.5	18800	27.6	444	0.1 U	0.42 U	114 J
CUA0051	GS	10	08/05/1998	0		6.9	0.87 J	21.9 J	16700	308	707	0.07 J	1.8 J	159
CUA0052	GS	10	08/05/1998	0		8.8	0.27 J	26.1 J	20800	31.2	1010	0.05 U	2.2	105
CUA0053	GS	10	08/05/1998	0		8.1	0.33 J	22.8 J	19200	33.5	891	0.05 U	2 J	96.2
CUA0054	GS	10	08/05/1998	0		7.9	0.15 J	22.3 J	19200	26.5	837	0.05 U	2	102
CUA0055	GS	10	08/05/1998	0		8.6	0.06 U	25.3 J	22100	22.9	766	0.05 U	2.2	88.3
CUA0056	GS	10	08/05/1998	0		5.5	1.2	38.5 J	15900	68.5	677	0.05 U	1.7 J	241
CUA0057	GS	10	08/05/1998	0		9.1	0.57 J	23.2	21700	58.9	990	0.05 J	2.6	133
CUA00710	GS	10	08/02/1998	0	0.76 J	17.8 J	3.1	36.6	24400	138	870	0.07 UJ	2.8	822
CUA00711	GS	10	08/02/1998	0	1.6 J	22.4 J	4.2	44.9	26900	449	1320	0.19 UJ	3.9	2660
CUA00712	GS	10	08/02/1998	0		17.3 J	0.06 U	24.1	24500	31	769	0.05 UJ	2.3	70.4
CUA00713	GS	10	08/02/1998	0	0.73 J	29.5 J	1.3	31.8	23200	48.7	720	0.05 UJ	2.3	143
CUA00714	GS	10	08/02/1998	0		17.3 J	0.72 J	27.8	26000	57.1	819	0.05 UJ	2.7	259
CUA0078	GS	10	08/02/1998	0		13 J			17800	208	1020			
CUA0078	GS	10	08/02/1998	0	2.1 J		9.3	70.4				0.1 UJ	3	1100
CUA0079	GS	10	08/02/1998	0	0.83 J	21.9 J	3.5	36.9	29500	155	1060	0.07 UJ	3.1	1000
CUA02110	GS	10	08/03/1998	0		16.7 J	3.2	25.4	29600	202	1300	0.17 J		577
CUA02110	GS	10	08/03/1998	0	1.5 J								0.44 U	
CUA02111	GS	10	08/03/1998	0	1.2 J	12.5 J	6.1	33.7	24800	302	1260	0.22 J	2.9 U	777
CUA02112	GS	10	08/03/1998	0	3.1 J	20.3 J	13.7	36.1	29100	722	1780	0.32 J	4.4 U	1640
CUA02113	GS	10	08/03/1998	0	1.1 J	15.7 J	2.8	26.3	28600	192	1160	0.13 J		448
CUA02113	GS	10	08/03/1998	0									0.42 U	
CUA02114	GS	10	08/03/1998	0	1.9 J	14.2 J	12.5	35.6	26300	590	1380	0.27 J	3.5 U	1530
CUA0218	GS	10	08/03/1998	0	1.2 J	9.7	2.2	17.3	19500	101	859	0.13	0.45 U	265
CUA0219	GS	10	08/03/1998	0	1.8 J	12.4	9.5	27.5	19900	384	1210	0.25	0.45 U	1040
CUA2031	GS	25	08/30/2000											2100
CUA2031	GS	25	08/30/2000			69 U				535				
CUA2032	GS	25	08/30/2000			66 U				210				491

Data Summary Table
Spokane River - segment SpokaneRSeg01

Boxed Sample Results Exceed Screening Level By More Than 1X

Shaded Sample Results Exceed Screening Level By More Than 10X

Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Surface Soil (mg/kg)														
CUA2033	GS	25	08/30/2000			70 U				433				2770
CUA2034	GS	25	08/30/2000			77 U				580				2210
CUA2035	GS	25	08/30/2000			53 U				90.7				834
CUA2036	GS	25	08/30/2000			53 U				161				718
CUA2037	GS	25	08/30/2000			68 U				489				1300
Subsurface Soil (mg/kg)														
CUA20110	HA	24	09/01/1999	0	1.2 J	21.4	10.1	38.1 J	27600 J	719 J	1650 J	0.15	2.5	2190 J
CUA20110	HA	24	09/01/1999	0	2.7 J	23.4	14.5	43.6	25200	1310	1880	0.23	3	2420
CUA20110	HA	24	09/01/1999	0	2.8 J	28.4	18	50.7 J	27500 J	* 2360 J	2820 J	0.28	4.1	3230 J
CUA20110	HA	24	09/01/1999	0		21.6	16.2	32 J	23300 J	656 J	1740 J	0.22	2.4	2040 J
CUA20110	HA	24	09/01/1999	0	2.2 J									
CUA20110	HA	24	09/01/1999	0	4.1 J	35.1	17.4	55.8 J	28000 J	* 2350 J	2890 J	0.45	4.7	3320 J
CUA20110	HA	24	09/01/1999	0	1.6 J	21.8	11	29.5 J	25400	867	1710	0.16	2.7	2490
CUA20110	HA	24	09/01/1999	0								0.55		
CUA20110	HA	24	09/01/1999	0	3.7 J	31.7	21	47.4 J	27200 J	* 1590 J	2810 J		3.4	3270 J
CUA20210	HA	24	09/01/1999	0	1 U	15.3	9.3	32.8 J	23700	479	1520	0.18 J	0.49 J	2020
CUA20210	HA	24	09/01/1999	0	1 U	15.1	6.4	32.7 J	24400	328	1260	0.17 J	0.24 J	1880
CUA20210	HA	24	09/01/1999	0	1.9 J	21.6	9.9	42.9 J	29800	484	1970	0.28 J	0.33 J	2340
CUA20210	HA	24	09/01/1999	0	1.5 J	17	9.1	310 J	27000	379	1470	0.18 J	0.2 U	2090
CUA20210	HA	24	09/01/1999	0	1.6 J	15.8	10.1	67.9 J	28100	503	944	0.18 J	0.2 U	2140
CUA20210	HA	24	09/01/1999	0	3.1 J	23.6	13.6	45.9 J	29000	534	1270	0.29 J	0.31 J	2480
CUA20210	HA	24	09/01/1999	0	2 J	19.1	7	33.1 J	30400	261	970	0.18 J	0.2 U	1430
CUA20310	HA	24	09/01/1999	0	2 J	31.7	11.4	41.9	25700	1070	2850 J	0.24	3.4	2640 J
CUA20310	HA	24	09/01/1999	0		16.2	4.1	28.1	21100	234	1150 J	0.06 J	1.6 J	2180 J
CUA20310	HA	24	09/01/1999	0		13.9	4	28.1 J	21600	146	879	0.05 U	1.4 J	1570
CUA20310	HA	24	09/01/1999	0		13.2	4.2	26.1 J	21000	154	882	0.05 U	1.3 J	1180
CUA20310	HA	24	09/01/1999	0	0.86 J	16.4	7.8	25.8 J	22200	306	1180	0.08 J	1.7 J	1770
CUA20310	HA	24	09/01/1999	0	1.1 J	13.5	5.7			326	978	0.06 J	1.4 J	1360
CUA20310	HA	24	09/01/1999	0				22.7 J	20100					
CUA20310	HA	24	09/01/1999	0	0.67 J	13.6	5.3	19.8 J	19800	335	1110	0.06 J	1.5 J	1500
Sediment (mg/kg)														
CUA00310	RV	10	08/04/1998	0	0.98 U	12.2	0.8 J	11.7	14600	29	459	0.1 U	0.39 U	152
CUA00311	RV	10	08/04/1998	0	1 U	11.4	0.6 J	15.3	17400	30.4	560	0.1 U	0.42 U	121
CUA00312	RV	10	08/04/1998	0								0.11 U		

Data Summary Table
Spokane River - segment SpokaneRSeg01

Boxed Sample Results Exceed Screening Level By More Than 1X

Shaded Sample Results Exceed Screening Level By More Than 10X

Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Sediment (mg/kg)														
CUA00312	RV	10	08/04/1998	0	1.3 J	21	6.9	25.7	22300	180	695		0.42 U	1190
CUA00313	RV	10	08/04/1998	0	1 U	18.3	0.56 J	20	23000	31.8	670	0.1 U	0.41 U	108
CUA00314	RV	10	08/04/1998	0	1.1 U	12	0.55 J	22.2	18700	44.3	557	0.1 U	0.45 J	127 J
CUA00315	RV	10	08/04/1998	0	1 U	9.1	4.7	17	16500	173	451	0.1 U	0.41 U	1290
CUA00316	RV	10	08/06/1998	0	1.2 J	8.1	2.7	16	19200	94.1	439	0.1 U	0.4 U	867
CUA00317	RV	10	08/06/1998	0	1.1 U	5	2.6	7.6	10000	98.6	248	0.11 U	0.42 U	751
CUA00318	RV	10	08/06/1998	0	1.1 U	8.6	3.6	16.3	18900	114	395	0.12 U	0.44 U	1220
CUA00319	RV	10	08/06/1998	0	1 U	6.2	3	16.3	15300	43.6	289	0.1 U	0.41 U	671
CUA00320	RV	10	08/06/1998	0	1.1 U	23.2	1.5	22.3	20000	51.1	378	0.1 U	0.42 U	427
CUA00321	RV	10	08/06/1998	0	1.1 U	10.1	2.5	9.6	10300	93.8	193	0.11 U	0.45 U	652
CUA0038	RV	10	08/04/1998	0	1.3 J	12.8	0.51 J	18.2	18500	39	612	0.1 U	0.42 U	137 J
CUA0039	RV	10	08/04/1998	0		20.6	6.5			170			0.42 U	1140
CUA0039	RV	10	08/04/1998	0	3.3 J			34.6	40700		1150	0.16		
CUA00510	RV	10	08/05/1998	0		11.1	0.66 J	24.8	23300	42.3	763	0.05 U	2.5	275
CUA00511	RV	10	08/05/1998	0		10.6	1 J	27.1 J	23600	49.8 J	784	0.05 U	2.3	344 J
CUA00512	RV	10	08/05/1998	0		11.1	1.3	24.1 J	23500	51.3 J	870	0.05 U	2.4	479 J
CUA00513	RV	10	08/05/1998	0		10.3	0.67 J	27.9 J	23800	38.4 J	767	0.05 U	2.4	327 J
CUA00514	RV	10	08/07/1998	0		10.8	0.67 J	29.1 J	24000	45.4 J	774	0.06 U	2.4	274 J
CUA00515	RV	10	08/05/1998	0	1.6 J	9.7	5	36.9 J	22800	51.9 J	541	0.05 U	2.2	1040 J
CUA00516	RV	10	08/05/1998	0	1.2 J	15.5	10.3	30.4 J	24700	57.3 J	809	0.05 U	2.8	2470 J
CUA00517	RV	10	08/05/1998	0	1.4 J	11.9	7.3	23.4 J	20500	53.9 J	672	0.06 U	2.1 J	1380 J
CUA00518	RV	10	08/05/1998	0								0.05 U		
CUA00518	RV	10	08/05/1998	0		14.5	3	26 J	24000	155 J	794		2.5	1530 J
CUA00519	RV	10	08/05/1998	0	2.1 J	14.7	20.4	41.7 J	20800	762 J	1300	0.14 U	3.4	2720 J
CUA00520	RV	10	08/05/1998	0	0.72 J	12.8	1.6	23.3 J	23600	27.1 J	987	0.05 U	2.5	369 J
CUA00521	RV	10	08/05/1998	0	1.2 J	14.4	11.5	30.7 J	25000	34.7 J	1230	0.05 U	2.9	1400 J
CUA0058	RV	10	08/05/1998	0		11.5	1.1	26.5 J	22900	65.3	914	0.05 U	2.4	473
CUA0059	RV	10	08/05/1998	0		10.9	0.13 J	27.5 J	24800	26.7	853	0.05 U	2.4	156
CUA0061	RV	10	08/03/1998	0		8	2.6	47.2 J	19400	54.7	636	0.05 U	1.9 J	324
CUA00610	RV	10	08/03/1998	0	3.2 J	6.8	2.5	42.1 J	20400	181 J	478	0.05 U	1.9 J	549 J
CUA00611	RV	10	08/03/1998	0	2.5 J	8.2 J	1.7	24.6	20900	92.9	512	0.09 J	1.9 J	387
CUA00612	RV	10	08/03/1998	0	3.3 J	8.6 J	1	18.2	20500	98.9	512	0.08 J	1.9 J	306
CUA00613	RV	10	08/03/1998	0	2.8 J	6.1 J	1.7	65.3	20800	88.4	281	0.1 J	2 J	343
CUA00614	RV	10	08/03/1998	0	4.4 J	4.9 J	2	30.8	19400	142	326	0.17 J	2 U	523
CUA0062	RV	10	08/03/1998	0		9.1	2.2	37.5	20900	63	663	0.05 U	2.2	187
CUA0063	RV	10	08/03/1998	0	0.7 J	8.2	1.4	62 J	21500	62.3	643	0.05 U	2.2	219
CUA0064	RV	10	08/03/1998	0	0.96 J	13.4	2.1	47.8 J	23300	49.6 J	1120	0.06 U	2.5	400 J

Data Summary Table
Spokane River - segment SpokaneRSeg01

Boxed Sample Results Exceed Screening Level By More Than 1X

Shaded Sample Results Exceed Screening Level By More Than 10X

Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Sediment (mg/kg)														
CUA0065	RV	10	08/03/1998	0		15.7	1.3	57.2 J	23900	49.3 J	749	0.06 U	2.2	206 J
CUA0066	RV	10	08/03/1998	0	0.86 J	12	1.4	31.6 J	20100	51.9 J	785	0.05 U	1.9 J	202 J
CUA0067	RV	10	08/03/1998	0	1.1 J	9.8	2.1	27.6 J	16500	57.7 J	800	0.08 U	1.8 J	328 J
CUA0068	RV	10	08/03/1998	0	2.5 J	4.8	5.6 J	55.6 J	20700	85.9 J	529	0.08 U	2.6	716 J
CUA0069	RV	10	08/03/1998	0	1.4 J	9.2	0.73 J	29.4 J	20300	42.9 J	502	0.05 U	2 J	225 J
CUA0071	RV	10	08/02/1998	0	1.1 J	14.1 J	2.4	27.9	19500	99.5	644	0.08 UJ	2.1	1260
CUA00715	RV	10	08/02/1998	0		22.4 J	0.11 J	32.3	29000	29.3	1110	0.05 UJ	3.1	96.3
CUA00716	RV	10	08/02/1998	0		14.9 J	0.1 J	33.5	24500	30	874	0.08 UJ	2.4	98.8
CUA00717	RV	10	08/02/1998	0	1.3 J	18.3 J	4.2	56.1	26500	168	969	0.09 UJ	2.7	999
CUA00718	RV	10	08/02/1998	0	0.89 J	18.2 J	5	49.7	27000	167	938	0.1 UJ	2.7	1180
CUA00719	RV	10	08/02/1998	0	1.2 J	12.1 J	6.5	94.8	24700	164	865	0.07 UJ	2.7	1130
CUA0072	RV	10	08/02/1998	0	1.2 UJ	18.9	5.5	45.8 J	25700	140	1270	0.14	3.4	2580
CUA00720	RV	10	08/02/1998	0	1 J	17.9 J	5.8	48.9	25400	119	733	0.08 UJ	2.5	691
CUA00721	RV	10	08/02/1998	0		13.4 J	4.9	118	22300	88.7	638	0.05 UJ	2.2	614
CUA0073	RV	10	08/02/1998	0							730	0.05 U		
CUA0073	RV	10	08/02/1998	0	0.99 J	11.5	5.2	66 J	25500	96.1			2.7	1050
CUA0074	RV	10	08/02/1998	0	1.1 UJ	15.5	4.9	44 J	24000	132	891	0.08 J	2.6	1100
CUA0075	RV	10	08/02/1998	0	1.1 J	8.2	5.9	38.6 J	18000	120	457	0.06 J	2 J	1010
CUA0076	RV	10	08/02/1998	0	1.6 J	11.5	4.3	29.1 J	18400	184	461	0.08 J	2.2	1160
CUA0077	RV	10	08/02/1998	0		15.1	6.2	32.2 J	24200	36	858	0.05 U	2.3	580
CUA0081	RV	10	07/30/1998	0	1.7 J	17.1	14.6	57.3	21800	519	1400	0.29	0.42 U	2330
CUA00810	RV	10	07/30/1998	0	1.3 U	15.1	10.5	30.8	28700	423	1560 J	0.1 UJ	0.6 J	1890
CUA00811	RV	10	07/30/1998	0	1.2 U	16.3	14.2	39.1	28400	520	2080 J	0.1 UJ	0.83 J	2140
CUA00812	RV	10	07/30/1998	0	1.7 J	15.5	13	39.5	27400	512	1580 J	0.1 UJ	0.76 J	2020
CUA00813	RV	10	07/30/1998	0	2 J	13.7	21.8	34	26300	513	1530 J	0.1 UJ	0.7 J	2200
CUA00814	RV	10	07/30/1998	0	2.3 J	5.9	26.2	24.5	16600	352	276 J	0.1 UJ	0.88 J	2130
CUA0082	RV	10	07/30/1998	0		19.7		32.5		551	1500	0.29		
CUA0082	RV	10	07/30/1998	0	2.5 J		16		24800				0.7 J	2220
CUA0083	RV	10	07/30/1998	0	2.3 J	29.3	8.4	33.5	40100	191	652	0.1 U	0.41 U	3260
CUA0084	RV	10	07/30/1998	0	2.4 J	27.1	9.1	47.1	40600	188	847	0.11 U	0.44 U	1600
CUA0085	RV	10	07/30/1998	0	2.4 J	38.7	14.5	49.2	42400	646	1290	0.1 U	0.66 J	4860
CUA0086	RV	10	07/30/1998	0	2.8 J	24.5	13.5	28.7	34900	133	1100	0.1 U	0.41 U	2340
CUA0087	RV	10	07/30/1998	0	2 J	25.1	11.8	32.8	34600	251	933	0.1 U	0.41 U	2230
CUA0088	RV	10	07/30/1998	0	2.5 U	12.6	17.1	28.8	24300	490	420 J	0.1 UJ	0.56 J	2420
CUA0089	RV	10	07/30/1998	0	1.8 U	11.7	7.5	21.4	28700	477	596 J	0.1 UJ	0.54 J	2130
CUA0211	LK	10	08/03/1998	0	5.5 J	59.3	17	49	61100	561	2920	0.2	0.47 U	2460
CUA0212	LK	10	08/03/1998	0	5 J	74	7.7	32.2	66800	467	3040	0.13 U	0.52 U	2030

Data Summary Table
Spokane River - segment SpokaneRSeg01

Boxed Sample Results Exceed Screening Level By More Than 1X

Shaded Sample Results Exceed Screening Level By More Than 10X

Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Sediment (mg/kg)														
CUA02122	LK	10	08/03/1998	0	4.1 J	39.8	21.6	98.4	41000	452	4380	0.1 U	0.41 U	2020
CUA02123	LK	10	08/03/1998	0	2.3 J	63.5	17.6	27.7	51500	420	6300	0.11 U	0.45 U	2020
CUA02124	LK	10	08/03/1998	0	3.1 J	83.4	17.2	49.4	65600	460	7480	0.11 U	0.44 U	2170
CUA02125	LK	10	08/03/1998	0	3.5 J	52.2	11.3	32.8	48000	361	3720	0.13 U	0.51 U	1900
CUA02126	LK	10	08/03/1998	0	2.4 J	19.8	16.6	58.8	31600	343	1380	0.12 U	0.47 U	2080
CUA02127	LK	10	08/03/1998	0	3.3 J	45.8	17.3	42.3	41500	371	3850	0.11	0.43 U	2050
CUA02128	LK	10	08/03/1998	0	2.4 J	38.8	15.5	40.7	42200	435	2840	0.13 U	0.53 U	2170
CUA0213	LK	10	08/03/1998	0		77	11.1	29.6	64100	503	5470			2080
CUA0213	LK	10	08/03/1998	0	3.4 J							0.11 U	0.43 U	
CUA0214	LK	10	08/03/1998	0	1.4 J	53.4	2.1	144	58300	54.7	3330	0.11 U	0.46 U	441
CUA0215	LK	10	08/03/1998	0	3.1 J	59.2	12.6	112	53300	481	3920	0.11 U	0.43 U	1910
CUA0216	LK	10	08/03/1998	0	2.3 J	37.2	9.6	88.7	41700	245	2180	0.12	0.43 U	1590
CUA0217	LK	10	08/03/1998	0							2320	0.11 U	0.43 U	
CUA0217	LK	10	08/03/1998	0	4.2 J	56.7	8.7	104	61300	405				1880
DA011	FP	25	08/29/2000			57 U				56 U				2730
DA012	FP	25	08/29/2000			66 U				339				1860
DA013	FP	25	08/29/2000			55 U				123				5480
DA014	FP	25	08/29/2000			53 U				205				955
DA015	FP	25	08/29/2000			62 U								
DA015	FP	25	08/29/2000							300				2040
DA016	FP	25	08/29/2000			57 U				201				748
DA017	FP	25	08/29/2000			70 U				393				1440
DA031	FP	25	09/01/2000			71 U				546				1490
DA032	FP	25	09/01/2000			89 U				744				1990
DA033	FP	25	09/01/2000			65 U				396				1440
DA034	FP	25	09/01/2000			72 U				506				1910
DA035	FP	25	09/01/2000			69 U				410				1980
DA036	FP	25	09/01/2000							417				1810
DA036	FP	25	09/01/2000			67 U								
DA037	FP	25	09/01/2000			60 U				312				1460
DA041	FP	25	08/28/2000			45 U				46 U				155
DA042	FP	25	08/28/2000			49 U				50 U				180
DA043	FP	25	08/28/2000			55 U				168				805
DA044	FP	25	08/28/2000			42 U				44 U				147
DA045	FP	25	08/28/2000			38 U				45.8				143
DA046	FP	25	08/28/2000			49 U				105				624
DA047	FP	25	08/28/2000			49 U				102				468

Data Summary Table
Spokane River - segment SpokaneRSeg01

Boxed Sample Results Exceed Screening Level By More Than 1X	Shaded Sample Results Exceed Screening Level By More Than 10X
	Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Sediment (mg/kg)														
DA051	FP	25	08/28/2000	0		56 U				191				631
DA051	FP	25	08/28/2000	0.13		74 U				536				1320
DA051	FP	25	08/28/2000	0.36		43 U				43 U				455
DA051	FP	25	08/28/2000	0.46		43 U				43 U				437
DA051	FP	25	08/28/2000	0.79		43 U				43 U				244
DA061	FP	25	08/28/2000			84 U				751				1740
DA062	FP	25	08/28/2000			89 U				938				4580
DA063	FP	25	08/28/2000			76 U				652				1710
DA064	FP	25	08/28/2000			94 U				1030				2310
DA065	FP	25	08/28/2000			72 U				517				1660
DA066	FP	25	08/28/2000											1730
DA066	FP	25	08/28/2000			81 U				704				
DA067	FP	25	08/28/2000			81 U				730				2150
DA071	FP	25	08/28/2000	0		65 U				440				1660
DA071	FP	25	08/28/2000	0.16		130 U				* 2280				4210
DA071	FP	25	08/28/2000	0.62		57 U				241				2620
DA071	FP	25	08/28/2000	0.76		46 U				55.8				842
DA071	FP	25	08/28/2000	1.57		44 U				45 U				273
DA071	FP	25	08/28/2000	2.3		43 U				45 U				258
DA081	FP	25	08/28/2000			69 U				304				1120
DA082	FP	25	08/28/2000			64 U				312				1180
DA083	FP	25	08/28/2000			62 U				293				1080
DA084	FP	25	08/28/2000			65 U				376				1430
DA085	FP	25	08/28/2000			65 U				268				1050
DA086	FP	25	08/28/2000			64 U				279				1120
DA087	FP	25	08/28/2000			76 U				533				1890
DA091	FP	25	08/29/2000			69 U				445				1740
DA092	FP	25	08/29/2000			74 U				526				1650
DA093	FP	25	08/29/2000			75 U				586				1920
DA094	FP	25	08/29/2000							502				
DA094	FP	25	08/29/2000			73 U								1510
DA095	FP	25	08/29/2000			71 U				381				3660
DA096	FP	25	08/29/2000			78 U				700				1730
DA097	FP	25	08/29/2000			75 U				656				2000
DA101	FP	25	08/29/2000			120 U				* 1810				3540
DA102	FP	25	08/29/2000			78 U				626				1570
DA103	FP	25	08/29/2000							861				2410

Data Summary Table
Spokane River - segment SpokaneRSeg01

Boxed Sample Results Exceed Screening Level By More Than 1X

Shaded Sample Results Exceed Screening Level By More Than 10X

Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Sediment (mg/kg)														
DA103	FP	25	08/29/2000			86 U								
DA104	FP	25	08/29/2000			90 U				956				2340
DA105	FP	25	08/29/2000			86 U				903				1940
DA106	FP	25	08/29/2000			120 U				* 1530				3130
DA107	FP	25	08/29/2000			100 U				1290				2640
DA121	FP	25	08/29/2000			70 U				385				1420
DA1210	FP	25	08/29/2000			95 U				467				1430
DA1211	FP	25	08/29/2000			75 U				166				942
DA1212	FP	25	08/29/2000			78 U				201				774
DA1213	FP	25	08/29/2000			64 U				64 U				167
DA1214	FP	25	08/29/2000			61 U				63 U				60 U
DA122	FP	25	08/29/2000			75 U				534				2500
DA123	FP	25	08/29/2000			78 U								1590
DA123	FP	25	08/29/2000							592				
DA124	FP	25	08/29/2000			130 U				* 1950				3960
DA125	FP	25	08/29/2000			75 U				430				2010
DA126	FP	25	08/29/2000			85 U				580				2570
DA127	FP	25	08/29/2000			74 U				451				1750
DA128	FP	25	08/29/2000			90 U				352				1520
DA129	FP	25	08/29/2000			87 U				269				1220
SR10	RV	17	02/17/1999	0	8.6	39	15 J	58	49000	520	2300	0.27	1.7 J	6500
SR11	RV	17	02/17/1999	0	5.9	19	12 J	48	41000	490	1500	0.32	1 J	1100
SR12	RV	17	02/17/1999	0	7.9	39	15 J	45	40000	940	3200	0.47	2.1 J	2600
SR13	RV	17	02/17/1999	0	4.2	20	26 J	36	34000	470	2300	0.21	1.2 J	2200
SR14	RV	17	02/17/1999	0	5.7	30	15 J	43	40000	690	2300	0.33	1.6 J	2400
SR15	RV	17	02/17/1999	0	4.8	18	8.4 J	33		690	1100	0.27	1.6 J	1800
SR15	RV	17	02/17/1999	0					31000					
SR16	RV	17	02/17/1999	0	21	51	19 J	66	46000	* 3500	4200	0.73	4.7 J	4200
SR17	RV	17	02/17/1999	0	10	48	8.6 J	68	55000	1100	1400	0.36	2.2 J	5500
SR18	RV	17	02/17/1999	0	5.8	24	14 J	40	37000	930	2400	0.29	1.6 J	2300
SR19	RV	17	02/17/1999	0	9	41	14 J	51	41000	1300	3100	0.5	2.8 J	2800
SR7	RV	17	02/17/1999	0	15	70	12 J	67	56000	1200	2100	0.75	3.6 J	4700
SR8	RV	17	02/17/1999	0	12	53	19 J	49	43000	1400	4000	0.78	3.7 J	2900
SR9	RV	17	02/17/1999	0	5.9	16	28 J	37		640		0.24		
SR9	RV	17	02/17/1999	0					32000		1400		1.5 J	2100

Surface Water - Total Metals (ug/l)

Data Summary Table
Spokane River - segment SpokaneRSeg01

Boxed Sample Results Exceed Screening Level By More Than 1X

Shaded Sample Results Exceed Screening Level By More Than 10X
Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Surface Water - Total Metals (ug/l)														
SR5	RV	2	11/11/1997		0.52 U	0.48 UJ	0.2 J	**1.7 J**	31 U	3	3.5 J	0.1 U	0.22 U	**83.6**
SR5	RV	3	05/06/1998		0.5 U	1 U	0.46	3 U	82.6 U	5.8	15.4	0.2 U	0.3 U	**84.7**
SR50	RV	18	10/19/1998				1 UJ			1				**50**
SR50	RV	18	10/19/1998				1 UJ			1 UJ				10
SR50	RV	18	11/13/1998				1 UJ			1				
SR50	RV	18	12/16/1998				1 UJ			1				**80**
SR50	RV	18	01/28/1999				1 UJ			2				**100**
SR50	RV	18	02/10/1999				1 UJ			1				**90**
SR50	RV	18	03/11/1999				1 UJ			2				**90**
SR50	RV	18	04/12/1999				1 UJ			3				**90**
SR50	RV	18	05/11/1999							4				**80**
SR50	RV	18	06/07/1999							6				**60**
SR50	RV	18	07/12/1999				0.23			1.6				**47.2**
SR50	RV	18	08/09/1999				0.19			1.2				**39.8**
SR50	RV	18	09/07/1999				0.16			1.7				**36.5**
SR55	RV	18	04/15/1999				1 UJ			3				
SR55	RV	18	05/13/1999							4				**70**
SR55	RV	18	06/17/1999							3				**50**
SR55	RV	18	07/15/1999							1.2				**39.8**
SR55	RV	18	08/11/1999							1.2				**37.9**
SR55	RV	18	09/09/1999							1.1				28.4
SR6	RV	2	11/11/1997		0.69 U	0.72 UJ	0.29 J	**2.3 J**	28.5 U	3.4	4.8 J	0.1 U	0.22 U	**84.2**
SR6	RV	3	05/06/1998		0.5 U	1 U	0.44	3 U	81.1 U	4.1	14.3	0.2 U	0.3 U	**83.9**
SR7	RV	2	11/11/1997		0.47 U	1.1 J	0.17 J	0.79 J	17.7 U	1	3 J	0.1 U	0.22 U	**67.9**
SR7	RV	3	05/06/1998		0.5 U	1 U	0.42	3 U	150 U	4.3	15.1	0.2 U	0.3 U	**79.5**
Surface Water - Dissolved Metals (ug/l)														
SR5	RV	2	11/11/1997		0.5 U	0.44	0.22	1.5	50.3	0.76	2	0.2 U	0.03 U	**71.8**
SR5	RV	3	05/06/1998		0.5 U	1 U	0.36	3 U	21.6 U	0.92	5 U	0.2 U	0.3 U	**77.5**
SR50	RV	18	10/19/1998				1 UJ			1 UJ				**51**
SR50	RV	18	10/19/1998				1 UJ			1 UJ				20 UJ
SR50	RV	18	11/13/1998				1 UJ			1 UJ				**58**
SR50	RV	18	12/16/1998				1 UJ			1 UJ				**77**
SR50	RV	18	01/28/1999				1 UJ			1				**91**
SR50	RV	18	02/10/1999				1 UJ			1				**82**
SR50	RV	18	03/11/1999				1 UJ			1				**85**
SR50	RV	18	04/12/1999				1 UJ			1				**88**

Data Summary Table
Spokane River - segment SpokaneRSeg01

Boxed Sample Results Exceed Screening Level By More Than 1X

Shaded Sample Results Exceed Screening Level By More Than 10X

Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Surface Water - Dissolved Metals (ug/l)														
SR50	RV	18	05/11/1999				**1**			1				**72**
SR50	RV	18	06/07/1999				**1**			1				**62**
SR50	RV	18	07/12/1999				1 U			1 U				**45**
SR50	RV	18	08/09/1999				1 U			1 U				**37**
SR50	RV	18	09/07/1999				1 U			1 U				**32**
SR55	RV	18	04/15/1999				1 UJ			1				**90**
SR55	RV	18	05/13/1999				**1**			1				**69**
SR55	RV	18	06/17/1999				**1**			1				**49**
SR55	RV	18	07/15/1999				1 U			1 U				**39**
SR55	RV	18	08/11/1999				1 U			1 U				**33**
SR55	RV	18	09/09/1999				1 U			1 U				24
SR6	RV	2	11/11/1997		0.5 U	0.44	0.2	1	10 U	0.64	1.5	0.2 U	0.03 U	**70.1**
SR6	RV	3	05/06/1998		0.5 U	1 U	0.29	3 U	26.4 U	0.7	5 U	0.2 U	0.3 U	**73.8**
SR7	RV	2	11/11/1997		0.5 U	1.1	0.12	0.56	10 U	0.34	1.4	0.2 U	0.03 U	**51.6**
SR7	RV	3	05/06/1998		0.5 U	1 U	0.27	3 U	38.7 U	0.51	5 U	0.2 U	0.3 U	**80.9**

Data Summary Table
Spokane River - segment SpokaneRSeg02

Boxed Sample Results Exceed Screening Level By More Than 1X

Shaded Sample Results Exceed Screening Level By More Than 10X

Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Surface Soil (mg/kg)														
CUA2041	GS	25	08/30/2000			56 U				77.2				4850
CUA2042	GS	25	08/30/2000			77 U				570				3190
CUA2043	GS	25	08/30/2000			59 U				137				3420
CUA2044	GS	25	08/30/2000			75 U				501				2210
CUA2045	GS	25	08/30/2000			66 U				377				1310
CUA2046	GS	25	08/30/2000			60 U				159				1240
CUA2047	GS	25	08/30/2000			74 U				463				1870
Subsurface Soil (mg/kg)														
CUA20410	HA	24	09/02/1999	0	1 U	13	3.5	33.2 J	26100	116	687	0.1 UJ	0.2 U	1990
CUA20410	HA	24	09/02/1999	0	1.9 J	22.3	6.5	31.1 J	38100	106	909	0.1 UJ	0.2 U	1360
CUA20410	HA	24	09/02/1999	0	3 J	29.8	15.5	38.8 J	29900	822	1720	0.38 J	0.55 J	2590
CUA20410	HA	24	09/02/1999	0	2.5 J	28.5	12.6	41.5 J	31900	647	1480	0.28 J	0.2 U	2610
CUA20410	HA	24	09/02/1999	0	2.8 J	30.8	13.3	41.1 J	33600	714	1610	0.34 J	0.2 U	2490
CUA20410	HA	24	09/02/1999	0	2.9 J	43.8	13	59.9 J	49300	537	1310	0.18 J	0.2 U	3470
CUA20410	HA	24	09/02/1999	0	2 J	45.6	11.1	47.3 J	43800	404	1660	0.17 J	0.2 U	4880
CUA20510	HA	24	09/02/1999	0	1.2 J	15.9	5.4	32.5 J	24000 J	799 J	1770 J	0.11	2.3	2440 J
CUA20510	HA	24	09/02/1999	0	1.4 J	16.4	5.2	32.6 J	27700 J	529 J	1340 J	0.06 J	2.1	4020 J
CUA20510	HA	24	09/02/1999	0	0.66 J	19.8	5.5	42.1 J	26900 J	771 J	1390 J	0.08 J	2.2	4450 J
CUA20510	HA	24	09/02/1999	0	0.93 J	17.6	7.3	36 J	25400 J	531 J	1300 J	0.05 U	1.6 J	3860 J
CUA20510	HA	24	09/02/1999	0	1.7 J	22.5	10.1	37.4 J	25200 J	1040 J	2110 J	0.16	2.5	2930 J
CUA20510	HA	24	09/02/1999	0	1.4 J	20.3		35.5 J					1.8 J	3030 J
CUA20510	HA	24	09/02/1999	0			9.4		27200 J	498 J	1420 J	0.19		
CUA20510	HA	24	09/02/1999	0								0.11		
CUA20510	HA	24	09/02/1999	0	1.7 J	24.8	10.1	46.5 J	28700 J	772 J	1650 J		2.4	2990 J
CUA20610	HA	24	09/02/1999	0	1 U	16.5	0.58 J	25.5 J	27700	88.2	503	0.18 J	0.2 U	266
CUA20610	HA	24	09/02/1999	0	1.6 J	15.2	1.3	39.1 J	42900	73.2	286	0.1 UJ	0.21 J	365
CUA20610	HA	24	09/02/1999	0	1 U	14.2	2.5	32	23600	173	673	0.1 UJ	0.2 U	592
CUA20610	HA	24	09/02/1999	0	1.2 J	14	2.4	33.2	24400	174	704	0.1 UJ	0.2 U	614
CUA20610	HA	24	09/02/1999	0	1 U	12.1	0.2 U	37.7	28000	98.1	645	0.1 UJ	0.2 U	228
CUA20610	HA	24	09/02/1999	0	1 U	5.2	0.2 U	30.9	13800	33.7	129	0.1 UJ	0.28 U	119
CUA20610	HA	24	09/02/1999	0	0.98 U	7.6	0.2 U	33.8	20500	112	321	0.1 UJ	0.2 U	254
CUA20810	HA	24	09/02/1999	0		7.7	0.1 U	25.1 J	22600	30.2	507	0.05 U	1.1 J	99.6
CUA20810	HA	24	09/02/1999	0		5.5	0.1 U	20.6 J	15700	25.1	395	0.05 U	0.89 J	73.6
CUA20810	HA	24	09/02/1999	0		5.6	0.1 U	23.6 J	19400	24.8	633	0.05 U	1 J	87.7
CUA20810	HA	24	09/02/1999	0		6.9	0.1 U	22.2 J	18100	54.6	526	0.05 U	0.85 J	172

Data Summary Table
Spokane River - segment SpokaneRSeg02

Boxed Sample Results Exceed Screening Level By More Than 1X	Shaded Sample Results Exceed Screening Level By More Than 10X	Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Subsurface Soil (mg/kg)														
CUA20810	HA	24	09/02/1999	0		5.1	0.1 U	19.3 J	13800	**40.4**	416	0.05 U	0.77 J	**82.3**
CUA20810	HA	24	09/02/1999	0		3.8	0.1 U	15.9	9470	**18.1**	300 J	0.05 U	0.69 J	50.5 J
CUA20810	HA	24	09/02/1999	0		3.1	0.1 U	14.9	8280	**21.4**	281 J	0.05 U	0.62 J	49.4 J
CUA20910	HA	24	09/02/1999	0			0.2 U		20200	**15.4**	331	0.1 UJ	0.2 U	
CUA20910	HA	24	09/02/1999	0	0.98 U	**10.2**		20.1						**69.2**
CUA20910	HA	24	09/02/1999	0	0.99 U	8.7	0.2 U	18.1	20100	14.5	293	0.1 UJ	0.2 U	**77.5**
CUA20910	HA	24	09/02/1999	0	0.98 U	**11.9**	0.2 U	19.1	**25500**	**18.6**	423	0.1 UJ	0.59 U	**90.7**
CUA20910	HA	24	09/02/1999	0	0.98 U	**25.2**	0.2 U	19	**28300**	13.4	390	0.1 UJ	0.2 U	**78.4**
CUA20910	HA	24	09/02/1999	0	0.99 U	**10.3**	0.2 U	26.3	22300	**16**	469	0.1 UJ	0.2 U	**78**
CUA20910	HA	24	09/02/1999	0	0.97 U	8.8	0.19 U	24.1	20000	**26.6**	414	0.1 UJ	0.19 U	**142**
CUA20910	HA	24	09/02/1999	0	1 U	**14.6**	0.2 U	19.2	**25500**	13.2	489	0.1 UJ	0.2 U	65.9
CUA21010	HA	24	09/02/1999	0		7.1	0.75 J	40.4	12000	**98**	168 J	0.46	1.1 J	**230 J**
CUA21010	HA	24	09/02/1999	0		6.1	0.36 J	17.2	12600	**41.4**	147 J	0.11	0.82 J	**169 J**
CUA21010	HA	24	09/02/1999	0		7.1	0.87 J	17.7	14300	**57.1**	132 J	0.06 J	1.1 J	**232 J**
CUA21010	HA	24	09/02/1999	0		6.5	2	25	14500	**110**	140 J	0.12	1.2 J	**436 J**
CUA21010	HA	24	09/02/1999	0		**9.4**	1.7	18.1	14500	**88.7**	203 J	0.06 J	1.9 J	**353 J**
CUA21010	HA	24	09/02/1999	0		8.4	2.5	19.3	14800	**92**	258 J	0.09	1.1 J	**377 J**
CUA21010	HA	24	09/02/1999	0								0.05 U		
CUA21010	HA	24	09/02/1999	0	1.3 J	**9.7**	1.5	18.4	14000	**79.7**	345 J		1.2 J	**337 J**
Sediment (mg/kg)														
DA151	FP	25	08/29/2000			64 U				**286**				**1760**
DA152	FP	25	08/29/2000			70 U				**446**				**1480**
DA153	FP	25	08/29/2000			52 U				**114**				**510**
DA154	FP	25	08/29/2000			47 U				**279**				**1110**
DA155	FP	25	08/29/2000			57 U				**167**				**885**
DA156	FP	25	08/29/2000			60 U				**260**				**1010**
DA157	FP	25	08/29/2000			67 U				**368**				**1590**
DA161	FP	25	08/29/2000			51 U				**170**				**679**
DA162	FP	25	08/29/2000			63 U				**252**				**1080**
DA163	FP	25	08/29/2000			110 U				**1310**				**3810**
DA164	FP	25	08/29/2000			68 U				**289**				**2840**
DA165	FP	25	08/29/2000							**297**				**1200**
DA165	FP	25	08/29/2000			63 U								
DA166	FP	25	08/29/2000			49 U				**102**				**984**
DA167	FP	25	08/29/2000							**69.1**				**818**
DA171	FP	25	08/30/2000			51 U				**129**				**541**

Data Summary Table
Spokane River - segment SpokaneRSeg02

Boxed Sample Results Exceed Screening Level By More Than 1X

Shaded Sample Results Exceed Screening Level By More Than 10X

Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Sediment (mg/kg)														
DA1710	FP	25	08/30/2000			64 U				114				411
DA1711	FP	25	08/30/2000			59 U				59 U				299
DA1712	FP	25	08/30/2000			56 U				57 U				193
DA1713	FP	25	08/30/2000			59 U				62 U				146
DA1714	FP	25	08/30/2000			67 U				132				262
DA172	FP	25	08/30/2000			53 U				216				948
DA173	FP	25	08/30/2000			51 U				52 U				162
DA174	FP	25	08/30/2000			89 U				730				3730
DA175	FP	25	08/30/2000			57 U				137				1050
DA176	FP	25	08/30/2000			49 U				119				470
DA177	FP	25	08/30/2000			63 U				93				252
DA178	FP	25	08/30/2000			73 U				138				989
DA179	FP	25	08/30/2000			68 U				78.9				855
DA181	FP	25	08/30/2000			54 U				95.4				418
DA182	FP	25	08/30/2000			90 U				479				2030
DA183	FP	25	08/30/2000			62 U				361				1920
DA184	FP	25	08/30/2000			58 U				144				1090
DA185	FP	25	08/30/2000			71 U				358				1610
DA186	FP	25	08/30/2000			74 U				398				1920
DA187	FP	25	08/30/2000			64 U				246				1240
DA201	FP	25	08/30/2000			59.7				175				859
DA202	FP	25	08/30/2000			62 U				343				964
DA203	FP	25	08/30/2000			54 U				296				1110
DA204	FP	25	08/30/2000			64 U				362				1460
DA205	FP	25	08/30/2000			57 U				239				1000
DA206	FP	25	08/30/2000			55 U				168				941
DA207	FP	25	08/30/2000											578
DA207	FP	25	08/30/2000			58 U				162				
DA211	FP	25	08/31/2000			74 U				479				1620
DA212	FP	25	08/31/2000			81 U				696				2020
DA213	FP	25	08/31/2000			72 U				451				1750
DA214	FP	25	08/31/2000			81 U				642				1970
DA215	FP	25	08/31/2000			85 U				774				2080
DA216	FP	25	08/31/2000			69 U				411				1520
DA217	FP	25	08/31/2000							552				
DA217	FP	25	08/31/2000			74 U								1780
DA231	FP	25	08/31/2000			71 U				423				1770

Data Summary Table
Spokane River - segment SpokaneRSeg02

Boxed Sample Results Exceed Screening Level By More Than 1X

Shaded Sample Results Exceed Screening Level By More Than 10X

Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Sediment (mg/kg)														
DA232	FP	25	08/31/2000			68 U				416				1270
DA233	FP	25	08/31/2000			76 U				489				1740
DA234	FP	25	08/31/2000			94 U				918				2970
DA235	FP	25	08/31/2000			69 U				452				1550
DA236	FP	25	08/31/2000			54 U				124				544
DA237	FP	25	08/31/2000			69 U				476				1870
DA241	FP	25	08/31/2000			82 U				629				2200
DA242	FP	25	08/31/2000			87 U				846				2130
DA243	FP	25	08/31/2000							657				
DA243	FP	25	08/31/2000			80 U								2160
DA244	FP	25	08/31/2000			71 U				580				1790
DA245	FP	25	08/31/2000			62 U				177				1010
DA246	FP	25	08/31/2000			78 U				634				1930
DA247	FP	25	08/31/2000			62 U				242				1380
DA251	FP	25	08/31/2000			56 U				195				1370
DA252	FP	25	08/31/2000			59 U				200				1100
DA253	FP	25	08/31/2000			62 U				172				1210
DA254	FP	25	08/31/2000			75 U				501				1660
DA255	FP	25	08/31/2000			58 U								
DA255	FP	25	08/31/2000							145				3590
DA256	FP	25	08/31/2000			64 U				273				1700
DA257	FP	25	08/31/2000			60 U				207				1520
DA261	FP	25	08/31/2000			60 U				213				1230
DA262	FP	25	08/31/2000			66 U				305				1850
DA263	FP	25	08/31/2000							353				1620
DA263	FP	25	08/31/2000			65 U								
DA264	FP	25	08/31/2000			55 U				167				1250
DA265	FP	25	08/31/2000			57 U				241				989
DA266	FP	25	08/31/2000			61 U				311				1520
DA267	FP	25	08/31/2000			40 U				230				1090
DA271	FP	25	08/31/2000			81 U				533				1900
DA272	FP	25	08/31/2000			68 U				379				1620
DA273	FP	25	08/31/2000			74 U								
DA273	FP	25	08/31/2000							435				1410
DA274	FP	25	08/31/2000			53 U				194				850
DA275	FP	25	08/31/2000			57 U				219				990
DA276	FP	25	08/31/2000			81 U				690				2390

Data Summary Table
Spokane River - segment SpokaneRSeg02

Boxed Sample Results Exceed Screening Level By More Than 1X

Shaded Sample Results Exceed Screening Level By More Than 10X

Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Sediment (mg/kg)														
DA277	FP	25	08/31/2000			62 U				477				2230
DA281	FP	25	09/01/2000			68 U				361				1140
DA282	FP	25	09/01/2000			68 U				442				1420
DA283	FP	25	09/01/2000			67 U				396				1680
DA284	FP	25	09/01/2000											1020
DA284	FP	25	09/01/2000			63 U				331				
DA285	FP	25	09/01/2000			65 U				400				1830
DA286	FP	25	09/01/2000			65 U				295				995
DA287	FP	25	09/01/2000			77 U				434				1210
DA291	FP	25	09/01/2000			57 U				182				928
DA292	FP	25	09/01/2000			53 U				110				773
DA293	FP	25	09/01/2000			53 U				192				806
DA294	FP	25	09/01/2000			65 U				442				1720
DA295	FP	25	09/01/2000			53 U				202				867
DA296	FP	25	09/01/2000			49 U				116				610
DA297	FP	25	09/01/2000			66 U				291				1300
SR20	RV	17	02/17/1999	0	4.9	20	25 J	33	29000	580	1700	0.29	1.6 J	2200
SR21	RV	17	02/17/1999	0	15	52	14 J	54	45000	1400	2600	0.76	3.7 J	4200
SR22	RV	17	02/17/1999	0	6.3	30	18 J	48	41000	830	2400	0.33	1.9 J	3100
SR23	RV	17	02/17/1999	0	4.2	19	7.3 J	32	35000	530	1500	0.26	1.2 J	1600
SR24	RV	17	02/17/1999	0	11	46	12 J	45	41000	1000	3100	0.62	2.8 J	3800
SR25	RV	17	02/17/1999	0	6.4	32	28 J	43	38000	770	2800	0.35	1.7 J	2600
SR26	RV	17	02/17/1999	0	8.5	45		48	47000			0.42	1.6 J	3600
SR26	RV	17	02/17/1999	0			20 J			730	2400			
SR27	RV	17	02/17/1999	0	5.3	29	27 J	49	35000	750	2700	0.26	1.8 J	2700
SR28	RV	17	02/17/1999	0	5.9	34	23 J	54	39000	820	3500	0.29	2.2 J	3000
SR29	RV	17	02/17/1999	0	6.5	26	11 J	44	40000	770	1600	0.21	1.5 J	3200
SR30	RV	17	02/17/1999	0	5.2	27	15 J	43	36000	930	1200	0.18	1.1 J	2200
Surface Water - Total Metals (ug/l)														
SR65	RV	18	04/15/1999				1 UJ			3				
SR65	RV	18	05/13/1999							5				80
SR65	RV	18	06/17/1999							3				50
SR65	RV	18	07/15/1999							1.2				42
SR65	RV	18	08/09/1999							1.1				32.1
SR65	RV	18	09/09/1999							0.67				23.6
SR70	RV	18	04/16/1999				1 UJ			3				

Data Summary Table
Spokane River - segment SpokaneRSeg02

Boxed Sample Results Exceed Screening Level By More Than 1X

Shaded Sample Results Exceed Screening Level By More Than 10X

Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Surface Water - Total Metals (ug/l)														
SR70	RV	18	05/14/1999							4				**70**
SR70	RV	18	06/18/1999							3				**50**
SR70	RV	18	07/15/1999							1				**40.1**
SR70	RV	18	08/09/1999							0.81				23.5
SR70	RV	18	09/09/1999							0.51				8.1
SR75	RV	18	10/19/1998				1 UJ			1				30
SR75	RV	18	11/17/1998				1 UJ			1				**40**
SR75	RV	18	01/19/1999				1 UJ			2				**90**
SR75	RV	18	02/09/1999				1 UJ			1				**80**
SR75	RV	18	03/17/1999				1 UJ			2				**100**
SR75	RV	18	04/13/1999				1 UJ			2				
SR75	RV	18	05/11/1999							4				**70**
SR75	RV	18	06/03/1999							8				**60**
SR75	RV	18	06/15/1999							3				**50**
SR75	RV	18	07/13/1999							1.1				**37.5**
SR75	RV	18	08/09/1999							1.4				23.8
SR75	RV	18	09/08/1999							0.55				8.1
SR80	RV	18	04/14/1999				1 UJ			1 UJ				
SR80	RV	18	05/12/1999							2				**60**
Surface Water - Dissolved Metals (ug/l)														
SR65	RV	18	04/15/1999				1 UJ			1				**92**
SR65	RV	18	05/13/1999				**1**			1				**71**
SR65	RV	18	06/17/1999				**1**			1				48
SR65	RV	18	07/15/1999				1 U			1 U				40
SR65	RV	18	08/09/1999				1 U			1 U				26
SR65	RV	18	09/09/1999				1 U			1 U				22
SR70	RV	18	04/16/1999				1 UJ			1				**83**
SR70	RV	18	05/14/1999				**1**			1				**72**
SR70	RV	18	06/18/1999				**1**			1				45
SR70	RV	18	07/15/1999				1 U			1 U				36
SR70	RV	18	08/09/1999				1 U			1 U				20
SR70	RV	18	09/09/1999				1 U			1 U				7
SR75	RV	18	10/19/1998				1 UJ			1 UJ				24
SR75	RV	18	11/17/1998				1 UJ			1 UJ				32
SR75	RV	18	01/19/1999				1 UJ			1				**69**
SR75	RV	18	02/09/1999				1 UJ			1				**69**

Data Summary Table
Spokane River - segment SpokaneRSeg02

Boxed Sample Results Exceed Screening Level By More Than 1X

Shaded Sample Results Exceed Screening Level By More Than 10X

Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Surface Water - Dissolved Metals (ug/l)														
SR75	RV	18	03/17/1999				1 UJ			1				**76**
SR75	RV	18	04/13/1999				1 UJ			1				**84**
SR75	RV	18	05/11/1999				**1**			1				**70**
SR75	RV	18	06/03/1999				**1**			**1.2**				**51**
SR75	RV	18	06/15/1999				**1**			1				45
SR75	RV	18	07/13/1999				1 U			1 U				35
SR75	RV	18	08/09/1999				1 U			1 U				20
SR75	RV	18	09/08/1999				1 U			1 U				7
SR80	RV	18	04/14/1999				1 UJ			1 UJ				20
SR80	RV	18	05/12/1999				**1**			1				**51**
SR80	RV	18	06/16/1999							1				
SR80	RV	18	07/14/1999				1 U			1 U				1
SR80	RV	18	08/10/1999				1 U			1 U				1 U
SR80	RV	18	09/08/1999				1 U			1 U				1 U

Data Summary Table
Spokane River - segment SpokaneRSeg03

Boxed Sample Results Exceed Screening Level By More Than 1X

Shaded Sample Results Exceed Screening Level By More Than 10X

Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Subsurface Soil (mg/kg)														
CUA21710	HA	24	09/03/1999	0	0.98 U	**10.2**	0.2 U	18 J	17400	14.6	351	0.18 J	0.2 U	**88.8**
CUA21710	HA	24	09/03/1999	0	0.97 U	**10**	0.19 U					0.35 J	0.19 U	
CUA21710	HA	24	09/03/1999	0				20.3 J	19600	**17.2**	392			**146**
CUA21710	HA	24	09/03/1999	0	1 U	9	0.2 U	20.2	20200	**15.8**	387	0.1 UJ	0.28 J	**121**
CUA21710	HA	24	09/03/1999	0	0.96 U	9.2	0.19 U	20.4	20300	**15.3**	443	0.1 UJ	0.19 U	**112**
CUA21710	HA	24	09/03/1999	0	0.98 U	**10.2**	0.2 U	26.6	19800	**16.1**	439	0.1 UJ	0.2 U	**95.3**
CUA21710	HA	24	09/03/1999	0	1.1 U	**11.5**	0.2 U	25.6	22300	**15.7**	552	0.1 UJ	0.2 U	**88.1**
CUA21710	HA	24	09/03/1999	0	0.97 U	**10.1**	0.19 U	23.7	20800	**16.3**	505	0.1 UJ	0.19 U	**88.1**
CUA21810	HA	24	09/09/1999	0	0.64 J	8.3	0.1 U	40.3 J	17700 J	**18.2 J**	293 J	0.07 U	1 J	**92.9 J**
CUA21810	HA	24	09/09/1999	0		**9.8**	0.1 U	38 J	19500	**19.2**	321	0.05 U	0.9 J	**147**
CUA21810	HA	24	09/09/1999	0			0.1 U	29.6 J	18600		268	0.05 U	1 J	**172**
CUA21810	HA	24	09/09/1999	0		**9.9**				**19.9**				
CUA21810	HA	24	09/09/1999	0		6.5	0.27 J	26.9 J	16800	**19.9**	229	0.05 U	0.87 J	**282**
CUA21810	HA	24	09/09/1999	0		**10.4**	0.1 U	22.7 J	20200 J	**25.1 J**	318 J	0.05 U	0.91 J	**298 J**
CUA21810	HA	24	09/09/1999	0		**9.6**	0.1 U	26.5 J	19300 J	**16.7 J**	241 J	0.05 U	0.93 J	**101 J**
CUA21810	HA	24	09/09/1999	0		9.2	0.1 U	19.2 J	18800 J	**20 J**	267 J	0.05 U	0.8 J	**202 J**
CUA21910	HA	24	09/03/1999	0		7.3	0.1 U	25.4 J	**25400**	**18.2**	272	0.05 U	1.1 J	**86.8**
CUA21910	HA	24	09/03/1999	0		7.8	0.1 U	23.5 J	**27400**	**17.7**	289	0.05 U	1.1 J	**93.7**
CUA21910	HA	24	09/03/1999	0		6.9	0.1 U	21.3 J	24700	**16.6**	255	0.05 U	1.1 J	**72.5**
CUA21910	HA	24	09/03/1999	0			0.1 U					0.05 U	1 J	**142**
CUA21910	HA	24	09/03/1999	0		7.3		25.2 J	**25300**	**19.4**	319			
CUA21910	HA	24	09/03/1999	0		**13.3**	0.1 U	19.8 J	24200	**16.7**	315	0.05 U	1.2 J	**80.6**
CUA21910	HA	24	09/03/1999	0		7	0.24 J	23.3 J	22300	**23.5**	436	0.05 U	0.98 J	**265**
CUA21910	HA	24	09/03/1999	0		**9.4**	0.1 U	25 J	**25300**	**17.9**	419	0.05 U	1.1 J	**76.8**
CUA22010	HA	24	09/03/1999	0	1 U	**10.1**	0.2 U	19.8	23500	13.8	288	0.1 UJ	0.2 U	51.3
CUA22010	HA	24	09/03/1999	0	1 U	9.1	0.2 U	18.1	23100	**18.4**	387	0.1 UJ	0.2 U	**147**
CUA22010	HA	24	09/03/1999	0	1 U	**10.9**	0.2 U	18.7	24300	14.1	393	0.1 UJ	0.2 U	**124**
CUA22010	HA	24	09/03/1999	0	1 U	**13.2**	0.2 U	24.7	**27500**	14.1	468	0.1 UJ	0.8 U	**70.4**
CUA22010	HA	24	09/03/1999	0	1.1 J	**13.3**	0.2 U	21.5	**26900**	12.5	428	0.1 UJ	1 U	**70**
CUA22010	HA	24	09/03/1999	0	1 U		0.2 U		**25500**	13.6		0.1 UJ		
CUA22010	HA	24	09/03/1999	0		**11.7**		21.8			543		0.83 U	**96.1**
CUA22010	HA	24	09/03/1999	0	1 U	**22.9**	0.2 U	18.5 J	22800	**20**	531	0.1 UJ	0.2 U	**207**
CUA22110	HA	24	09/08/1999	0		8.5	0.1 U	8 J	13400 J	11 J	204 J	0.05 U	0.61 J	**100 J**
CUA22110	HA	24	09/08/1999	0		**9.9**	0.09 U	10.6 J	13900 J	14.4 J	221 J	0.05 U	0.76 J	**129 J**
CUA22110	HA	24	09/08/1999	0		6.6	0.1 U	9.3 J	12400 J	13.4 J	196 J	0.05 U	0.66 J	**214 J**
CUA22110	HA	24	09/08/1999	0		9	0.1 U	10.3 J	13800 J	11.5 J	231 J	0.05 U	0.7 J	**129 J**
CUA22110	HA	24	09/08/1999	0		**11.3**	0.1 U	16.5 J	19000 J	**16.9 J**	361 J	0.05 U	0.97 J	**113 J**

Data Summary Table
Spokane River - segment SpokaneRSeg03

Boxed Sample Results Exceed Screening Level By More Than 1X

Shaded Sample Results Exceed Screening Level By More Than 10X

Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Subsurface Soil (mg/kg)														
CUA22110	HA	24	09/08/1999	0		**13**	0.1 U	18.2 J	19000 J	**20.2 J**	601 J	0.05 U	1.1 J	**111 J**
CUA22110	HA	24	09/08/1999	0		8.2	0.1 U	11.4 J	13700 J	**15.9 J**	187 J	0.05 U	0.83 J	**161 J**
CUA22210	HA	24	09/09/1999	0		**11.1**	0.2 U	22.4 J	22100	**16.9**	529	0.1 UJ	0.2 U	**120**
CUA22210	HA	24	09/09/1999	0	0.99 U									
CUA22210	HA	24	09/09/1999	0	1 U	9.2	0.21 U	19.6 J	19000	**15.8**	402	0.1 UJ	0.21 U	**117**
CUA22210	HA	24	09/09/1999	0	1 U	**11.1**	0.2 U	22.7 J	22100	**15.9**	501	0.1 UJ	0.2 U	**91.8**
CUA22210	HA	24	09/09/1999	0	0.99 U	**10.6**	0.2 U	19.5 J	22400	12.8	493	0.1 UJ	0.2 U	**94.5**
CUA22210	HA	24	09/09/1999	0	1 U	**9.7**	0.2 U	16.7 J	21000	11.7	405	0.1 UJ	0.2 U	**98.9**
CUA22210	HA	24	09/09/1999	0	1 U	8.8	0.2 U	21.6 J	21700	12.8	484	0.1 UJ	0.2 U	**76.3**
CUA22210	HA	24	09/09/1999	0	0.99 U	8.9	0.2 U	19.6 J	17900	13.1	474	0.1 UJ	0.2 U	**84.6**
CUA22310	HA	24	09/10/1999	0	0.98 U	**12.1**	0.2 U	16	17900	12.3	450	0.1 U	0.2 U	**81.5**
CUA22310	HA	24	09/10/1999	0	1 U	**18.3**	0.2 U	22.5	19500	**15.2**	412	0.1 U	0.2 U	55.9
CUA22310	HA	24	09/10/1999	0	1 U	5.3	0.2 U	14.3	13300	7.6	242	0.1 U	0.2 U	60.1
CUA22310	HA	24	09/10/1999	0	0.97 U	9	0.19 U	15.1	14400	10.6	237	0.1 U	0.19 U	**104**
CUA22310	HA	24	09/10/1999	0	1 U	**14.9**	0.2 U	19.7	19600	13.8	377	0.1 U	0.2 U	**70.8**
CUA22310	HA	24	09/10/1999	0		**12**	0.2 U		18900		400	0.1 U	0.23 J	**81.5**
CUA22310	HA	24	09/10/1999	0	0.97 U			20.9		12.7				
CUA22310	HA	24	09/10/1999	0	0.97 U	**9.7**	0.19 U	18.2	17400	11.3	344	0.1 U	0.19 U	**72.8**
CUA22410	HA	24	09/08/1999	0	0.98 U	5.8	0.2 U	13.4 J	14000	11.7	208	0.1 UJ	0.2 U	**190**
CUA22410	HA	24	09/08/1999	0	0.99 U	6.8	0.2 U	13.1 J	12700	8.5	292	0.1 UJ	0.2 U	52.9
CUA22410	HA	24	09/08/1999	0	0.99 U	5.7	0.2 U	11.2 J	13200	9.7	164	0.1 UJ	0.2 U	**209**
CUA22410	HA	24	09/08/1999	0	0.97 U		0.2 U			11.5		0.1 UJ	0.2 U	
CUA22410	HA	24	09/08/1999	0		8.4		20.8 J	18100		322			**202**
CUA22410	HA	24	09/08/1999	0	1 U	6.9	0.2 U	13.6 J	15200	10.4	299	0.1 UJ	0.2 U	**194**
CUA22410	HA	24	09/08/1999	0	1 U	7.9	0.2 U	18.8 J	18000	11.7	458	0.1 UJ	0.2 U	**95.9**
CUA22410	HA	24	09/08/1999	0	0.98 U	**12.2**	0.2 U	24.5 J	23300	14.5	660	0.1 UJ	0.2 U	**79.5**
CUA22510	HA	24	09/09/1999	0		4.2	0.1 U	8.2	9080	7.2	190 J	0.05 U	0.55 J	47.5 J
CUA22510	HA	24	09/09/1999	0		8.5	0.1 U	12.3	11500	9.2	232 J	0.05 U	0.73 J	39.7 J
CUA22510	HA	24	09/09/1999	0			0.1 U		10000			0.05 U		
CUA22510	HA	24	09/09/1999	0		6.6		11.2		8.4	238 J		0.57 J	34.1 J
CUA22510	HA	24	09/09/1999	0		6.4	0.1 U	11.3	11600	12.4	270 J	0.05 U	0.72 J	**100 J**
CUA22510	HA	24	09/09/1999	0		5.4	0.1 U	9.7	11400	8.7	247 J	0.05 U	0.7 J	53.2 J
CUA22510	HA	24	09/09/1999	0		6	0.1 U	10	11600	8.9	247 J	0.05 U	0.64 J	61 J
CUA22510	HA	24	09/09/1999	0		4.2	0.1 U	9.5	8560	5.8	202 J	0.05 U	0.48 J	26.5 J
Surface Water - Total Metals (ug/l)														
SR85	RV	18	10/20/1998				1 UJ			1				10

Data Summary Table
Spokane River - segment SpokaneRSeg03

Boxed Sample Results Exceed Screening Level By More Than 1X

Shaded Sample Results Exceed Screening Level By More Than 10X

Shaded Results With (*) Exceed Screening Level By More Than 100X

Location	Location Type	Ref	Date	Depth In Feet	Antimony	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Silver	Zinc
Surface Water - Total Metals (ug/l)														
SR85	RV	18	11/17/1998				1 UJ			1				10
SR85	RV	18	01/19/1999				1 UJ			1				**50**
SR85	RV	18	02/09/1999				1 UJ			1				**60**
SR85	RV	18	03/17/1999				1 UJ			1				**50**
SR85	RV	18	04/13/1999				1 UJ			2				
SR85	RV	18	06/03/1999							2				30
SR85	RV	18	06/15/1999							2				30
SR85	RV	18	07/13/1999											16.9
SR85	RV	18	08/10/1999											9.3
SR85	RV	18	09/08/1999											7.2
Surface Water - Dissolved Metals (ug/l)														
SR85	RV	18	10/20/1998				1 UJ			1 UJ				9 UJ
SR85	RV	18	11/17/1998				1 UJ			1 UJ				7.2
SR85	RV	18	01/19/1999				1 UJ			1 UJ				26
SR85	RV	18	02/09/1999				1 UJ			1 UJ				52
SR85	RV	18	03/17/1999				1 UJ			1				42
SR85	RV	18	04/13/1999				1 UJ			1				56
SR85	RV	18	05/11/1999				1 UJ			1				1.5
SR85	RV	18	06/03/1999				1 UJ			1				25
SR85	RV	18	06/15/1999				**1**			1				24
SR85	RV	18	07/13/1999				1 U			1 U				13
SR85	RV	18	08/10/1999				1 U			1 U				9
SR85	RV	18	09/08/1999				1 U			1 U				5

ATTACHMENT 3
Statistical Summary Tables for Metals

Statistical Summary of Total Metals Concentrations in Surface Soil
Segment SpokaneRSeg01
Units: mg/kg

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	Coefficient of Variation	Screening Level (SL)	Quantity Exceeding 1X the SL	Quantity Exceeding 10X the SL	Quantity Exceeding 100X the SL
Antimony	22	16	0.73	3.1	1.43	0.42	31.3	0	0	0
Arsenic	38	31	2.6	29.5	13.1	0.49	9.34	18	0	0
Cadmium	31	27	0.15	13.7	2.91	1.34	9.8	2	0	0
Copper	31	31	10.6	70.4	27.4	0.41	100	0	0	0
Iron	31	31	12,100	29,600	21,700	0.22	25,000	8	0	0
Lead	38	38	11.2	722	182	1.1	14.9	37	16	0
Manganese	31	31	205	1,780	838	0.43	1,760	1	0	0
Mercury	31	9	0.05	0.32	0.179	0.52	23.5	0	0	0
Silver	31	14	1.7	3.9	2.47	0.24	391	0	0	0
Zinc	38	38	37.5	2,770	651	1.18	66.4	36	14	0

Statistical Summary of Total Metals Concentrations in Subsurface Soil
Segment SpokaneRSeg01
Units: mg/kg

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	Coefficient of Variation	Screening Level (SL)	Quantity Exceeding 1X the SL	Quantity Exceeding 10X the SL	Quantity Exceeding 100X the SL
Antimony	25	16	0.67	4.1	2.06	0.48	31.3	0	0	0
Arsenic	28	28	8.4	136	23.2	1	9.34	27	1	0
Cadmium	28	28	0.43	21	9.14	0.55	9.8	12	0	0
Copper	28	28	7.7	310	42.5	1.28	100	1	0	0
Iron	28	28	11,000	30,400	23,700	0.19	25,000	12	0	0
Lead	28	28	48.8	2,360	685	0.91	14.9	28	25	3
Manganese	28	28	196	2,890	1,450	0.5	1,760	7	0	0
Mercury	28	22	0.06	0.55	0.213	0.56	23.5	0	0	0
Silver	28	23	0.24	4.7	1.76	0.74	391	0	0	0
Zinc	28	28	361	3,320	1,940	0.37	66.4	28	27	0

Statistical Summary of Total Metals Concentrations in Sediment
Segment SpokaneRSeg01
Units: mg/kg

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	Coefficient of Variation	Screening Level (SL)	Quantity Exceeding 1X the SL	Quantity Exceeding 10X the SL	Quantity Exceeding 100X the SL
Antimony	82	66	0.7	21	3.52	1	3	26	0	0
Arsenic	171	97	4.8	83.4	22.5	0.81	9.34	80	0	0
Cadmium	97	97	0.1	28	8.05	0.87	0.72	87	44	0
Copper	97	97	7.6	144	41.2	0.58	28	68	0	0
Iron	97	97	10,000	66,800	30,000	0.44	40,000	24	0	0
Lead	171	160	26.7	3,500	409	1.11	14.9	160	107	5
Manganese	97	97	193	7,480	1,440	0.94	663	67	1	0
Mercury	97	27	0.06	0.78	0.277	0.75	0.174	16	0	0
Silver	97	64	0.45	4.7	2.09	0.41	4.5	1	0	0
Zinc	171	170	96.3	6,500	1,550	0.75	66.4	170	124	0

Statistical Summary of Total Metals Concentrations in Surface Water
Segment SpokaneRSeg01
Units: ug/L

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	Coefficient of Variation	Screening Level (SL)	Quantity Exceeding 1X the SL	Quantity Exceeding 10X the SL	Quantity Exceeding 100X the SL
Arsenic	6	1	1.1	1.1	1.1	< 0.001	50	0	0	0
Cadmium	18	9	0.16	0.46	0.284	0.43	2	0	0	0
Copper	6	3	0.79	2.3	1.6	0.48	1	2	0	0
Lead	25	24	1	6	2.53	0.61	15	0	0	0
Manganese	6	6	3	15.4	9.35	0.66	50	0	0	0
Zinc	23	23	10	100	64.5	0.38	30	21	0	0

Statistical Summary of Dissolved Metals Concentrations in Surface Water
Segment SpokaneRSeg01
Units: ug/L

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	Coefficient of Variation	Screening Level (SL)	Quantity Exceeding 1X the SL	Quantity Exceeding 10X the SL	Quantity Exceeding 100X the SL
Arsenic	6	3	0.44	1.1	0.66	0.58	150	0	0	0
Cadmium	25	10	0.12	1	0.546	0.73	0.38	4	0	0
Copper	6	3	0.56	1.5	1.02	0.46	2.3	0	0	0
Iron	6	1	50.3	50.3	50.3	< 0.001	1,000	0	0	0
Lead	25	15	0.34	1	0.858	0.25	1.09	0	0	0
Manganese	6	3	1.4	2	1.63	0.2	20.4	0	0	0
Zinc	25	24	24	91	62.9	0.32	30	23	0	0

Statistical Summary of Total Metals Concentrations in Surface Soil
Segment SpokaneRSeg02
Units: mg/kg

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	Coefficient of Variation	Screening Level (SL)	Quantity Exceeding 1X the SL	Quantity Exceeding 10X the SL	Quantity Exceeding 100X the SL
Lead	7	7	77.2	570	326	0.61	14.9	7	5	0
Zinc	7	7	1,240	4,850	2,580	0.51	66.4	7	7	0

Statistical Summary of Total Metals Concentrations in Subsurface Soil
Segment SpokaneRSeg02
Units: mg/kg

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	Coefficient of Variation	Screening Level (SL)	Quantity Exceeding 1X the SL	Quantity Exceeding 10X the SL	Quantity Exceeding 100X the SL
Antimony	50	22	0.66	3	1.72	0.36	31.3	0	0	0
Arsenic	63	63	3.1	45.6	13.7	0.67	9.34	39	0	0
Cadmium	63	42	0.22	15.5	4.69	0.91	9.8	7	0	0
Copper	63	63	9.4	59.9	26	0.4	100	0	0	0
Iron	63	63	8,280	49,300	22,000	0.39	25,000	23	0	0
Lead	63	63	13.2	1,040	195	1.32	14.9	60	19	0
Manganese	63	63	118	2,110	636	0.82	1,760	2	0	0
Mercury	63	23	0.06	0.46	0.182	0.59	23.5	0	0	0
Silver	63	26	0.21	2.5	1.19	0.59	391	0	0	0
Zinc	63	63	49.4	4,880	1,020	1.29	66.4	60	21	0

Statistical Summary of Total Metals Concentrations in Sediment
Segment SpokaneRSeg02
Units: mg/kg

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	Coefficient of Variation	Screening Level (SL)	Quantity Exceeding 1X the SL	Quantity Exceeding 10X the SL	Quantity Exceeding 100X the SL
Antimony	11	11	4.2	15	7.2	0.44	3	11	0	0
Arsenic	108	12	19	59.7	35	0.37	9.34	12	0	0
Cadmium	11	11	7.3	28	18.2	0.38	0.72	11	11	0
Copper	11	11	32	54	44.8	0.16	28	11	0	0
Iron	11	11	29,000	47,000	38,700	0.13	40,000	4	0	0
Lead	109	105	69.1	1,400	390	0.67	14.9	105	88	0
Manganese	11	11	1,200	3,500	2,320	0.31	663	11	0	0
Mercury	11	11	0.18	0.76	0.361	0.49	0.174	11	0	0
Silver	11	11	1.1	3.7	1.92	0.39	4.5	0	0	0
Zinc	109	109	146	4,200	1,520	0.57	66.4	109	95	0

Statistical Summary of Total Metals Concentrations in Surface Water
Segment SpokaneRSeg02
Units: ug/L

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	Coefficient of Variation	Screening Level (SL)	Quantity Exceeding 1X the SL	Quantity Exceeding 10X the SL	Quantity Exceeding 100X the SL
Lead	32	31	0.51	8	2.24	0.75	15	0	0	0
Zinc	27	27	8.1	100	48.5	0.5	30	21	0	0

Statistical Summary of Dissolved Metals Concentrations in Surface Water
Segment SpokaneRSeg02
Units: ug/L

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	Coefficient of Variation	Screening Level (SL)	Quantity Exceeding 1X the SL	Quantity Exceeding 10X the SL	Quantity Exceeding 100X the SL
Cadmium	35	10	1	1	1	< 0.001	0.38	10	0	0
Lead	36	18	1	1.2	1.01	0.05	1.09	1	0	0
Zinc	35	33	1	92	46.2	0.55	50	13	0	0

Statistical Summary of Total Metals Concentrations in Subsurface Soil
Segment SpokaneRSeg03
Units: mg/kg

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	Coefficient of Variation	Screening Level (SL)	Quantity Exceeding 1X the SL	Quantity Exceeding 10X the SL	Quantity Exceeding 100X the SL
Antimony	39	2	0.64	1.1	0.87	0.37	31.3	0	0	0
Arsenic	84	84	3.5	22.9	8.66	0.37	9.34	33	0	0
Cadmium	84	2	0.24	0.27	0.255	0.08	9.8	0	0	0
Copper	84	84	5.1	40.3	16.6	0.44	100	0	0	0
Iron	84	84	7,580	27,500	16,900	0.32	25,000	7	0	0
Lead	84	84	5.8	25.1	13.2	0.32	14.9	30	0	0
Manganese	84	84	133	660	320	0.37	1,760	0	0	0
Mercury	84	3	0.18	0.59	0.373	0.55	23.5	0	0	0
Silver	84	51	0.23	1.2	0.752	0.29	391	0	0	0
Zinc	84	84	26.5	298	103	0.56	66.4	62	0	0

Statistical Summary of Total Metals Concentrations in Surface Water
Segment SpokaneRSeg03
Units: ug/L

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	Coefficient of Variation	Screening Level (SL)	Quantity Exceeding 1X the SL	Quantity Exceeding 10X the SL	Quantity Exceeding 100X the SL
Lead	8	8	1	2	1.38	0.38	15	0	0	0
Zinc	10	10	7.2	60	27.3	0.73	30	3	0	0

Statistical Summary of Dissolved Metals Concentrations in Surface Water
Segment SpokaneRSeg03
Units: ug/L

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	Coefficient of Variation	Screening Level (SL)	Quantity Exceeding 1X the SL	Quantity Exceeding 10X the SL	Quantity Exceeding 100X the SL
Cadmium	12	1	1	1	1	< 0.001	0.38	1	0	0
Lead	12	5	1	1	1	< 0.001	1.4	0	0	0
Zinc	12	11	1.5	56	23.7	0.81	75	0	0	0

ATTACHMENT 4
Screening Levels

SCREENING LEVELS

Based on the results of the human health and ecological risk assessments, 10 chemicals of potential concern (COPCs) were identified for inclusion and evaluation in the RI. The COPCs and appropriate corresponding media (soil, sediment, groundwater, and surface water) are summarized in Table 1. For each of the COPCs listed in Table 1, a screening level was selected.

The screening levels were used in the RI to help identify source areas and media of concern that would be carried forward for evaluation in the feasibility study (FS). The following paragraphs discuss the rationale for the selection of the screening levels.

Applicable risk-based screening levels and background concentrations were compiled from available federal numeric criteria (e.g., National Ambient Water Quality Criteria), regional preliminary remediation goals (PRGs) (e.g., EPA Region IX PRGs), regional background studies for soil, sediment, and surface water, and other guidance documents (e.g., National Oceanographic and Atmospheric Administration freshwater sediment screening values). Selected RI screening levels are listed in Tables 2 through 4.

For the evaluation of site soil, sediment, groundwater, and surface water chemical data, the lowest available risk-based screening level for each media was selected as the screening level. If the lowest risk-based screening level was lower than the available background concentration, the background concentration was selected as the screening level.

Groundwater data are screened against surface water screening levels to evaluate the potential for impacts to surface water from groundwater discharge.

For site groundwater and surface water, total and dissolved metals data are evaluated separately. Risk-based screening levels for protection of human health (consumption of water) are based on total metals results, therefore, total metals data for site groundwater and surface water were evaluated against screening levels selected from human health risk-based screening levels. Risk-based screening levels for protection of aquatic life are based on dissolved metals results, therefore, dissolved metals data for site groundwater and surface water were evaluated against screening levels selected from aquatic life risk-based screening levels.

Table 1
Chemicals of Potential Concern

Chemical	Human Health COPC			Ecological COPC		
	Soil/Sediment	Groundwater	Surface Water	Soil	Sediment	Surface Water
Antimony	X	X				
Arsenic	X	X	X	X	X	
Cadmium	X	X	X	X	X	X
Copper				X	X	X
Iron	X					
Lead	X	X	X	X	X	X
Manganese	X		X			
Mercury			X		X	
Silver					X	
Zinc	X	X	X	X	X	X

Table 2
Selected Screening Levels for Groundwater and Surface Water—Coeur d'Alene River Basin and Coeur d'Alene Lake

Chemical	Surface Water Total (µg/L)	Surface Water Dissolved (µg/L)	Groundwater Total (µg/L)	Groundwater Dissolved (µg/L)
Antimony	6[a]	2.92[b]	6[a]	2.92[b]
Arsenic	50[a]	150[c,d]	50[a]	150[c,d]
Cadmium	2[e]	0.38[b]	2[e]	0.38[b]
Copper	1[e]	3.2[c,d]	1[e]	3.2[c,d]
Iron	300[a]	1,000[c,d]	300[a]	1,000[c,d]
Lead	15[a]	1.09[b]	15[a]	1.09[b]
Manganese	50[a]	20.4[b]	50[a]	20.4[b]
Mercury	2[a]	0.77[c,d]	2[a]	0.77[c,d]
Silver	100[a]	0.43[c,d]	100[a]	0.43[c,d]
Zinc	30[e]	42[c,d]	30[e]	42[c,d]

[a]40 CFR 141 and 143. National Primary and Secondary Drinking Water Regulations. U.S. EPA Office of Water. Office of Groundwater and Drinking Water. http://www.epa.gov/OGWDW/wot/appa.html. October 18, 1999.
[b]Dissolved surface water 95th percentile background concentrations calculated from URS project database.
[c]Freshwater NAWQC for protection of aquatic life are expressed in terms of the dissolved metal in the water column.
[d]Freshwater NAWQC for cadmium, copper, lead, silver, and zinc are expressed as a function of hardness (mg/L of CaCO3) in the water column.
Values above correspond to a hardness value of 30 mg/L.
[e]Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota: 1996 Revision. U.S. Department of
Energy. Office of Environmental Management. ES/ER/TM-96/R2. Value based on total metals concentration.

Note:
µg/L - microgram per liter

Table 3
Selected Screening Levels for Surface Water—Spokane River Basin

Chemical	SpokaneRSeg01		SpokaneRSeg02		SpokaneRSeg03	
	Surface Water Total (μg/L)	Surface Water Dissolved (μg/L)	Surface Water Total (μg/L)	Surface Water Dissolved (μg/L)	Surface Water Total (μg/L)	Surface Water Dissolved (μg/L)
Antimony	6[a]	2.92[b]	6[a]	2.92[b]	6[a]	2.92[b]
Arsenic	50[a]	150[c]	50[a]	150[c]	50[a]	150[c]
Cadmium	2[e]	0.38[b]	2[e]	0.38[b]	2[e]	0.38[b]
Copper	1[e]	2.3[c,d]	1[e]	3.8[c,d]	1[e]	5.7[c,d]
Iron	300[a]	1,000[c]	300[a]	1,000[c]	300[a]	1,000[c]
Lead	15[a]	1.09[b]	15[a]	1.09[b]	15[a]	1.4[c,d]
Manganese	50[a]	20.4[b]	50[a]	20.4[b]	50[a]	20.4[b]
Mercury	2[a]	0.77[c]	2[a]	0.77[c]	2[a]	0.77[c]
Silver	100[a]	0.22[c,d]	100[a]	0.62[c,d]	100[a]	1.4[c,d]
Zinc	30[e]	30[c,d]	30[e]	50[c,d]	30[e]	75

[a]40 CFR 141 and 143. National Primary and Secondary Drinking Water Regulations. U.S. EPA Office of Water. Office of Groundwater and Drinking Water. http://www.epa.gov/OGWDW/wot/appa.html. October 18, 1999.
[b]Dissolved surface water 95th percentile background concentrations calculated from URS project database. Technical Memorandum. Estimation of Background Concentration in Soils, Sediments, and Surface Waters. Coeur d'Alene Basin RI/FS. URS. May 2001.
[c]Freshwater NAWQC for protection of aquatic life are expressed in terms of the dissolved metal in the water column.
[d]Freshwater NAWQC for cadmium, copper, lead, silver, and zinc are expressed as a function of hardness (mg/L of CaCO3) in the water column.
[e]Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota: 1996 Revision. U.S. Department of Energy. Office of Environmental Management. ES/ER/TM-96/R2. Value based on total metals concentration.

Note:
μg/L - microgram per liter

Table 4
Selected Screening Levels—Soil and Sediment

Chemical	Upper Coeur d'Alene River Basin		Lower Coeur d'Alene River Basin		Spokane River Basin	
	Soil (mg/kg)	Sediment (mg/kg)	Soil (mg/kg)	Sediment (mg/kg)	Soil (mg/kg)	Sediment (mg/kg)
Antimony	31.3[a]	3.30[b]	31.3[a]	3[c]	31.3[a]	3[c]
Arsenic	22[b]	13.6[b]	12.6[b]	12.6[b]	9.34[b]	9.34[b]
Cadmium	9.8[d]	1.56[b]	9.8[d]	0.678[b]	9.8[d]	0.72[b]
Copper	100[d]	32.3[b]	100[d]	28[c]	100[d]	28[c]
Iron	65,000[b]	40,000[c]	27,600[b]	40,000[c]	25,000[b]	40,000[c]
Lead	171[b]	51.5[b]	47.3[b]	47.3[b]	14.9[b]	14.9[b]
Manganese	3,597[b]	1,210[b]	1,760[a]	630[c]	1,760[a]	663[b]
Mercury	23.5[a]	0.179[b]	23.5[a]	0.179[b]	23.5[a]	0.174[c]
Silver	391[a]	4.5[c]	391[a]	4.5[c]	391[a]	4.5[c]
Zinc	280[b]	200[b]	97.1[b]	97.1[b]	66.4[b]	66.4[b]

[a]U.S. EPA Region IX Preliminary Remediation Goals for Residential or Industrial Soil http://www.epa.gov/region09/wasate/sfund/prg. February 3, 2000.
[b]Technical Memorandum. Estimation of Background Concentration in Soils, Sediments, and Surface Waters. Coeur d'Alene Basin RI/FS. URS. May 2001.
[c]Values as presented in National Oceanographic and Atmospheric Administration Screening Quick Reference Tables, NOAA HAZMAT Report 99-1, Seattle, WA. M. F. Buchman, 1999. Values generated from numerous reference documents.
[d]Final Ecological Risk Assessment. Coeur d'Alene Basin RI/FS. Prepared by CH2M HILL/URS for EPA Region 10. May 18, 2001. Values are the lowest of the NOAEL-based PRGs for terrestrial biota (Table ES-3).

Note:
mg/kg - milligram per kilogram